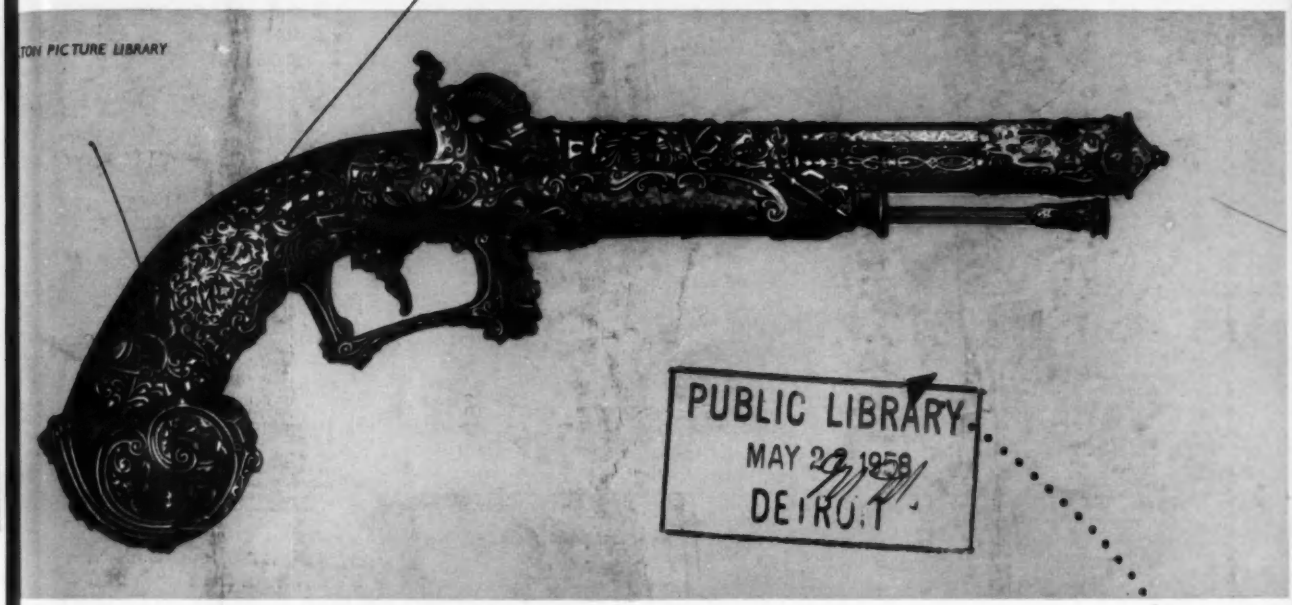
TECHNOLOGY DEPT.

Gas Journal

VOL. 294. 110th YEAR. LONDON, MAY 7, 1958. Nº 4947. PRICE 1/6



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DETROIT

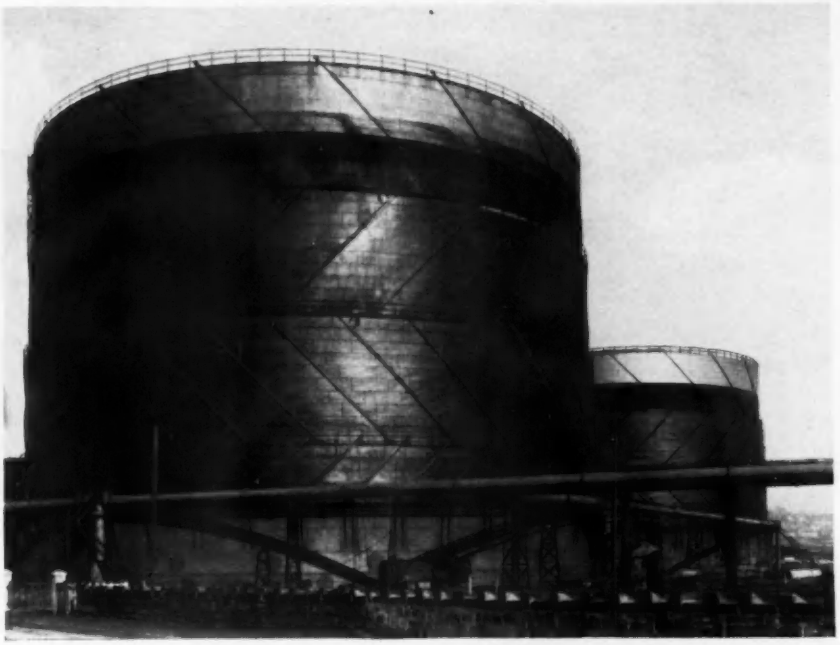
something in common

They remind one of different worlds, the Spanish forged iron pistol of 1850 and the modern T.G. meter. Yet, they have something in common—both are the products of true craftsmanship. The pistol delicately engraved and inlaid with damascene, designed and made by Eusebio Zuloago of Madrid, is presented as a fine example of the gunsmiths skill. The T.G. meter epitomizes craftsmanship and the T.G. 'G' prepayment mechanism is accepted as the most modern precision movement on the market. Something else is common, this Spanish pistol and a T.G. meter were both exhibited at the Great Exhibition of 1851.

Thomas Glover & Co. Ltd.

Gothic Works, Angel Road, Edmonton, N.18 and branches.

'IMUNOL' at the 'Home of Steel'



'IMUNOL' the Automatic Gas Holder Paint . . . .

1. Saves manpower and drastically reduces maintenance charges.

2. No scraping or derusting required.

3. Will not pick up usual oxide discoloration from water, thereby improving appearance.

4. Unnecessary to put Holder out of commission while being reconditioned.

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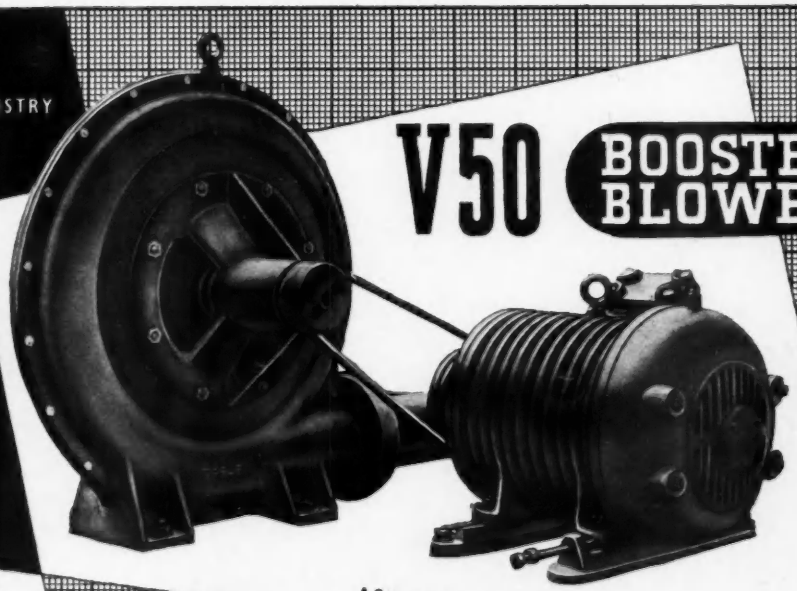

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600 C.F.M. AT 13" W.G. TO 1000 C.F.M. AT 9" W.G. } ON GAS

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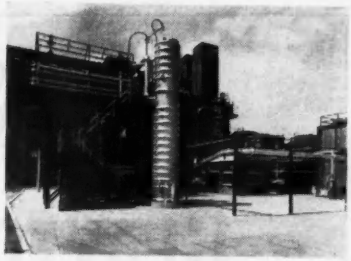
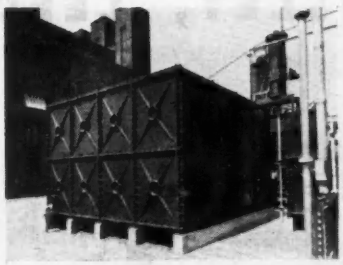
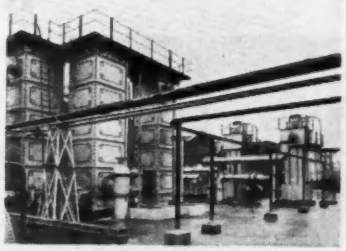


C.A.L. plant at Kingston Gas Works. (Concentration of ammonia)



Liquor tank at Kingston Gas Works.



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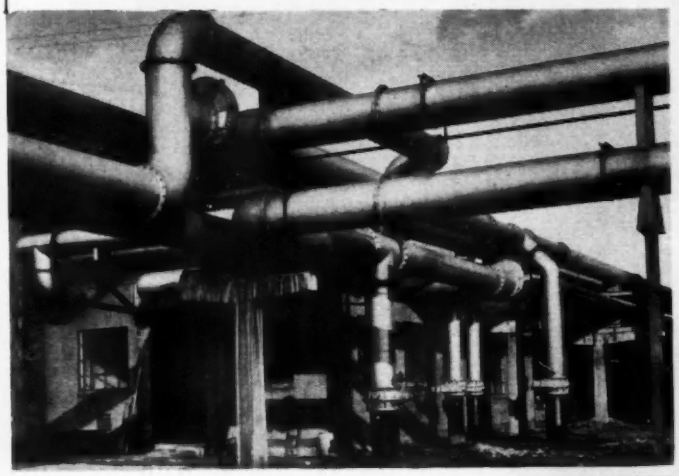

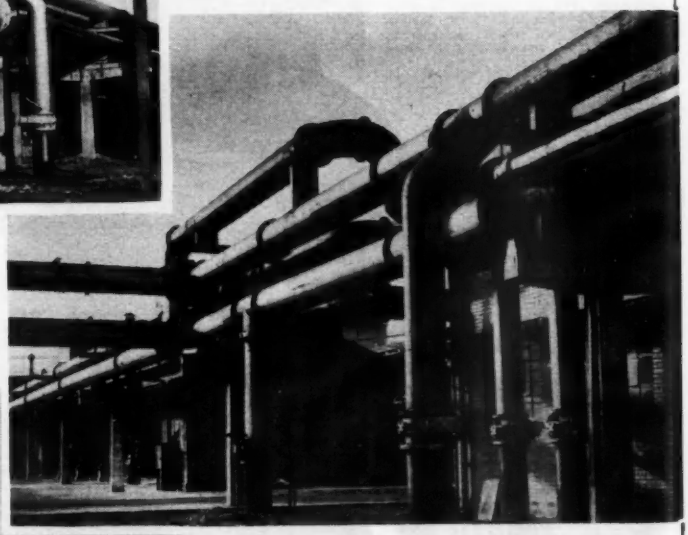

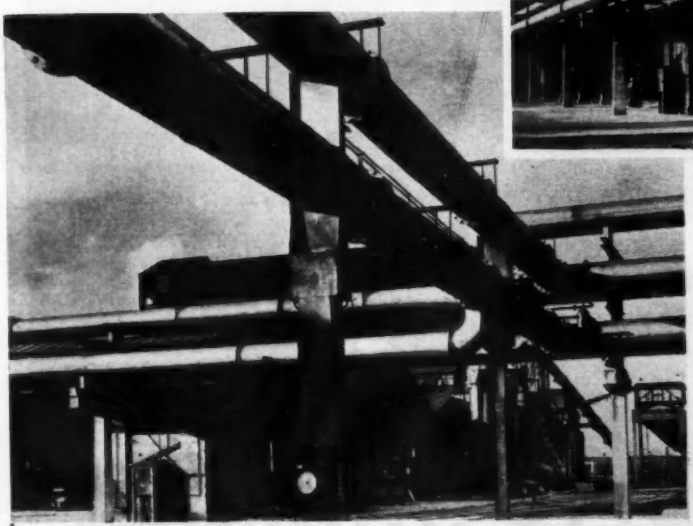

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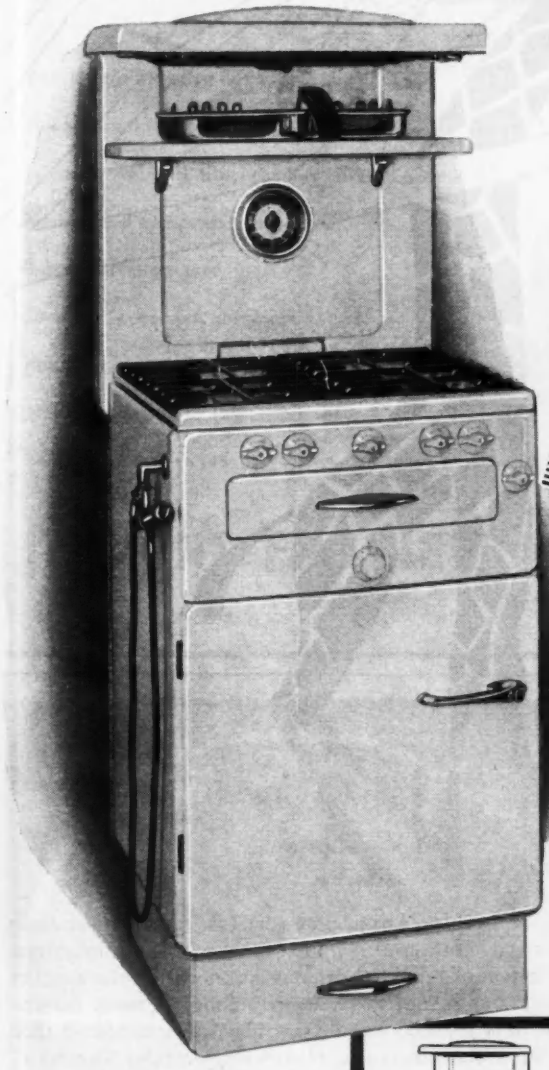

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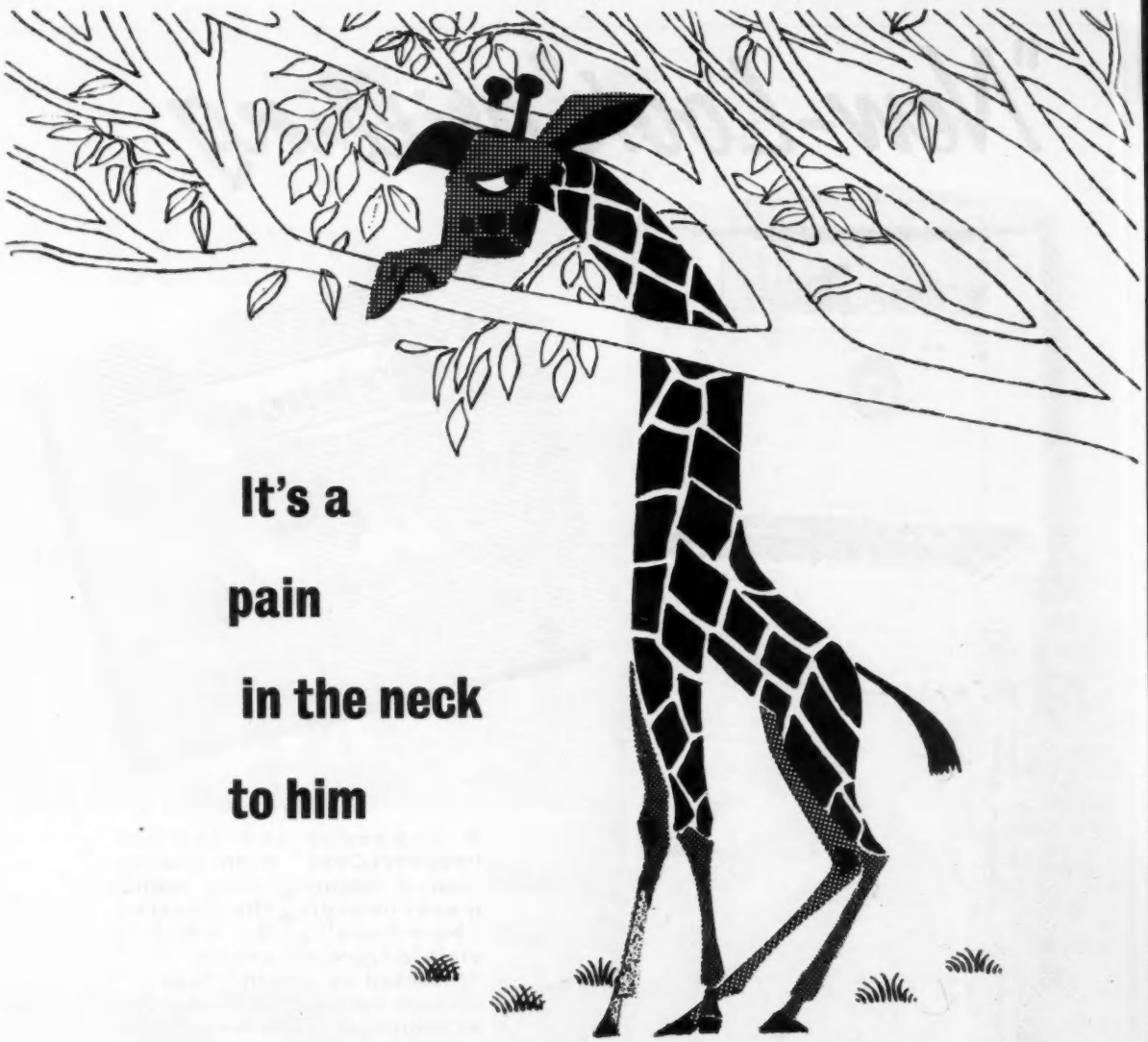

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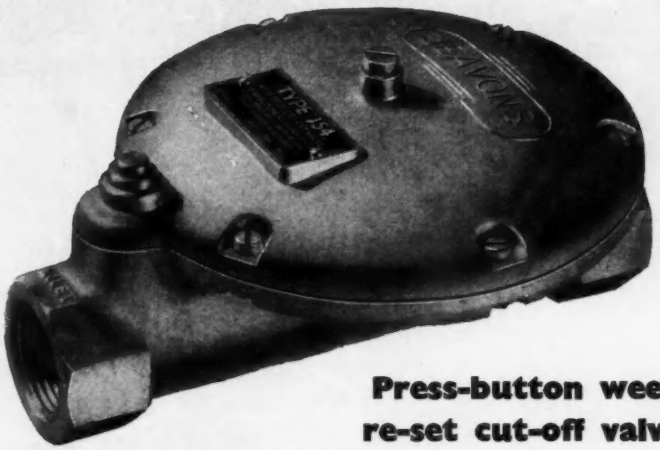

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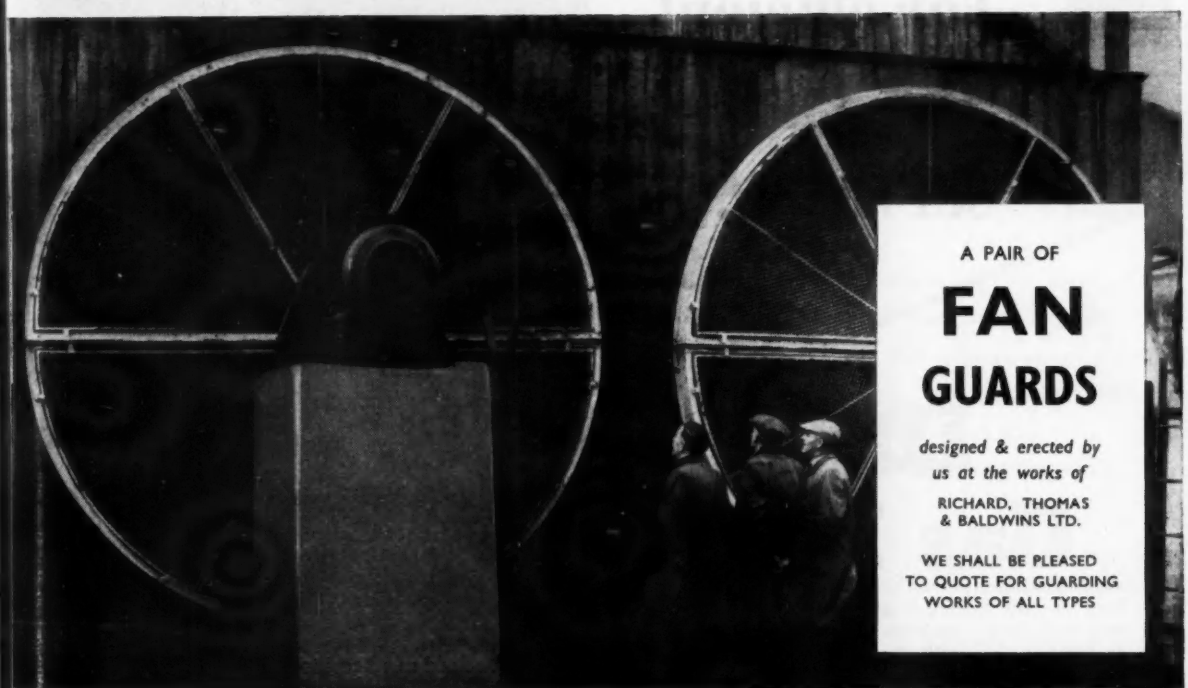

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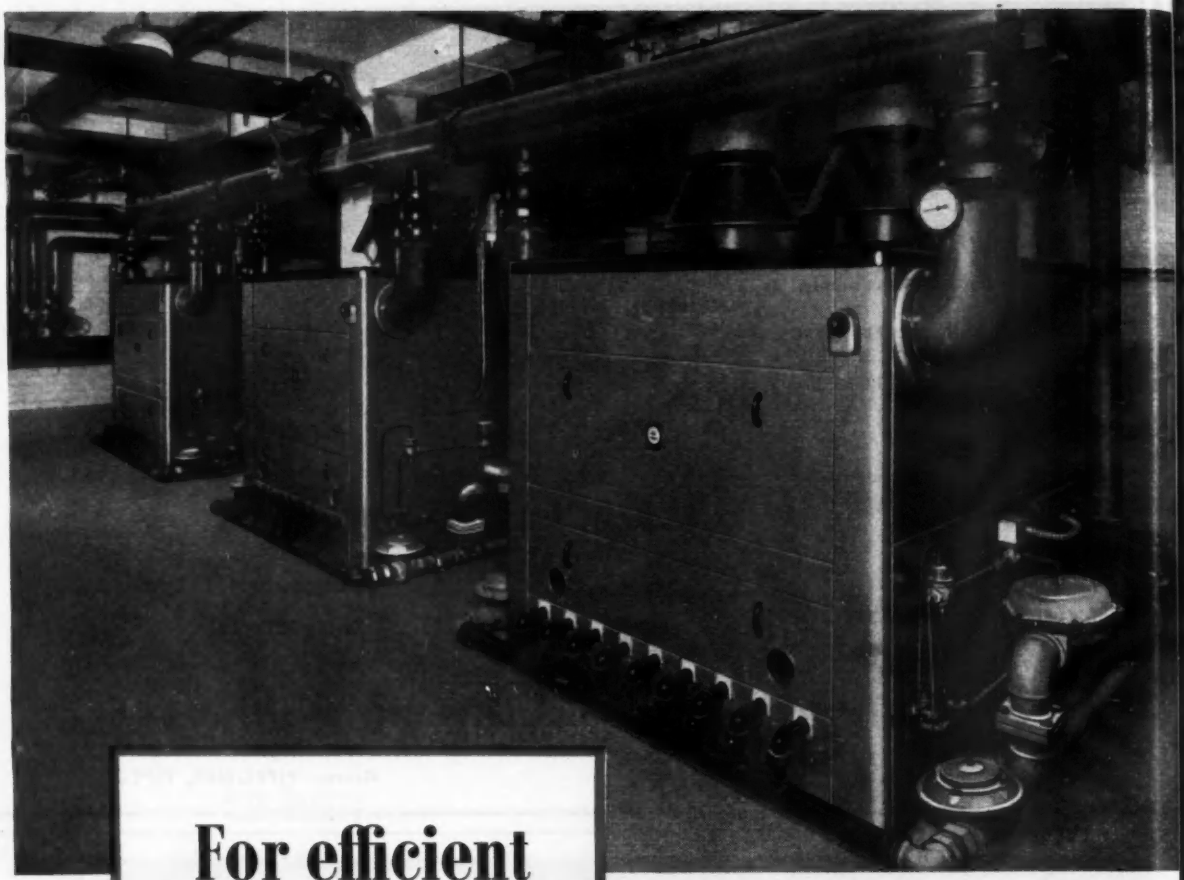

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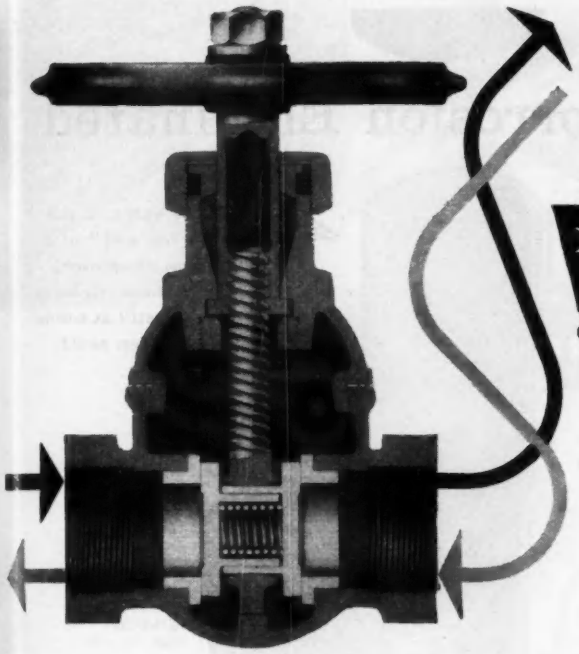

when the flow is in either direction . . .

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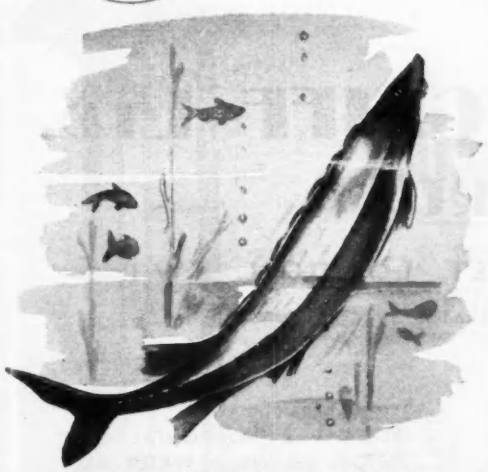
measured breathing.....



A 215 lb. sturgeon (caught in the Lake of the Woods, Ontario, in 1953) is believed to have lived for 150 years. Can't you imagine it, down there in the depths, its accurate, measured breathing reflected in the movement of its gills? A healthy type. Sound, dependable, creating amazing records for longevity.

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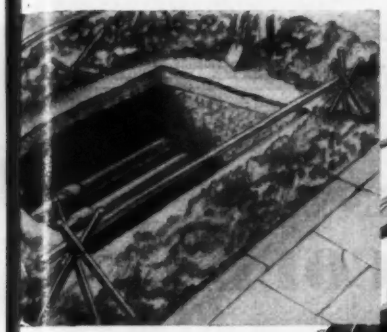

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The 'Cintel' Portable Metal Detector is the quickest and most economical method of locating hidden manhole covers, buried pipes, etc. If you are one of the few not yet using this instrument, may we send you details?

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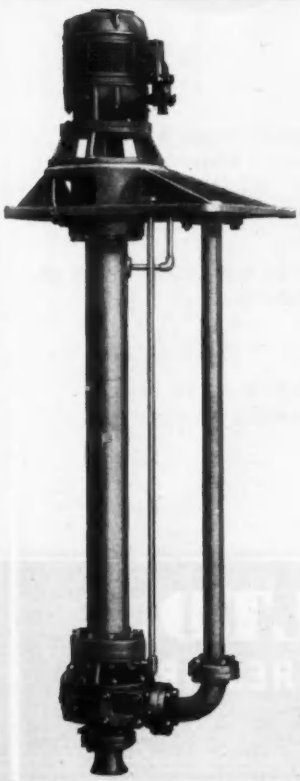

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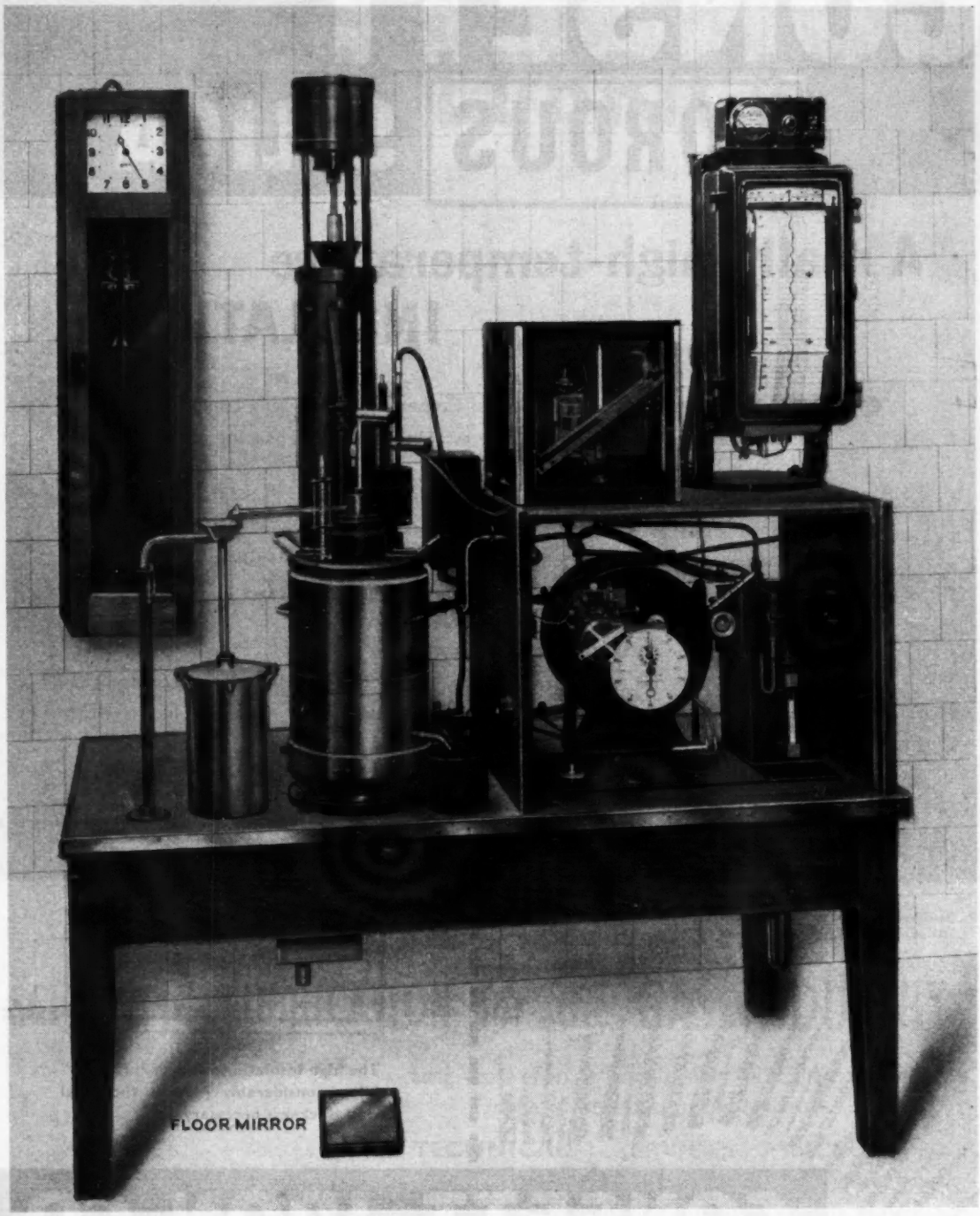
—FAIRWEATHER RECORDING CALORIMETER, MARK II



The new Fairweather Recording Calorimeter, Mark II, possesses all the accuracy and efficiency of its larger predecessor, but with many important improvements.

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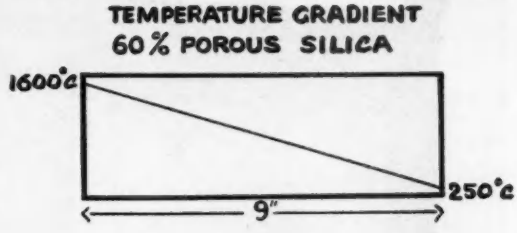

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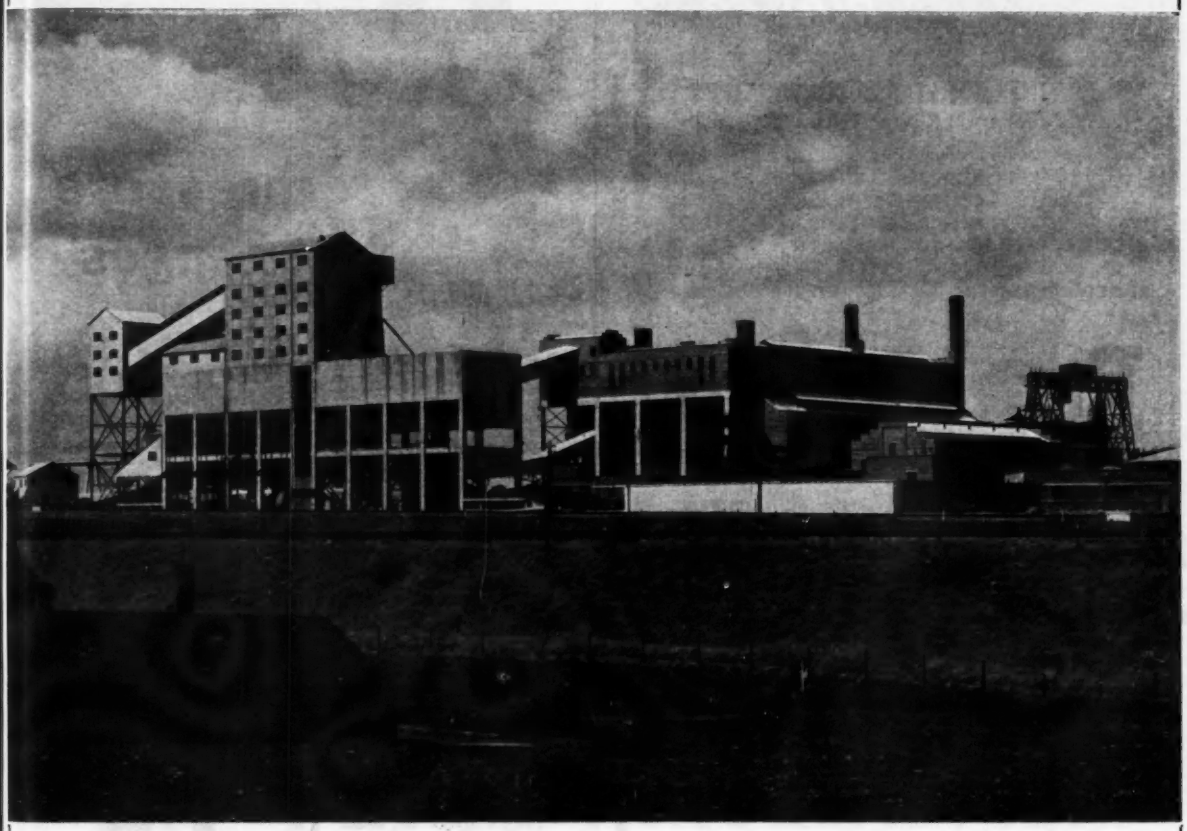

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Long years of experience enable us to offer a complete range of lubricants of the highest quality.

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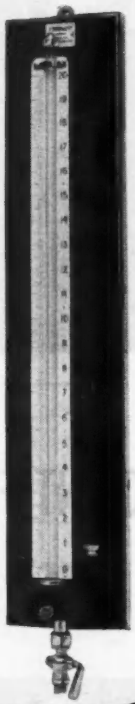

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TURBO-COMPRESSORS & EXHAUSTERS FOR AIR AND GAS

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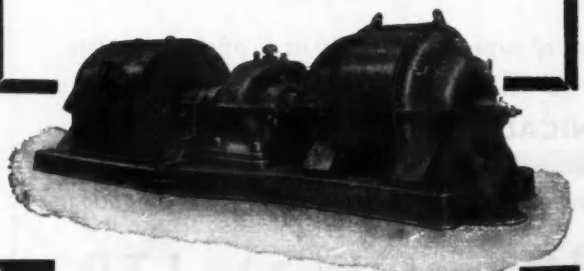

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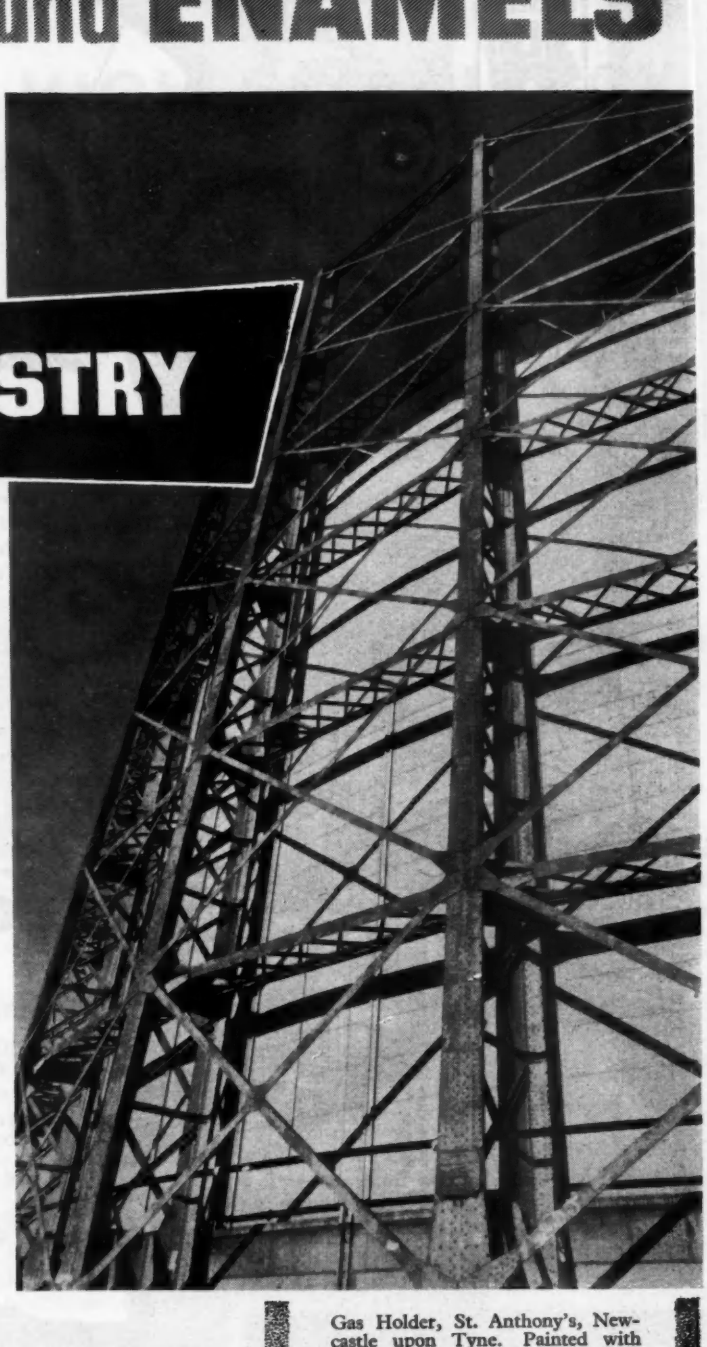

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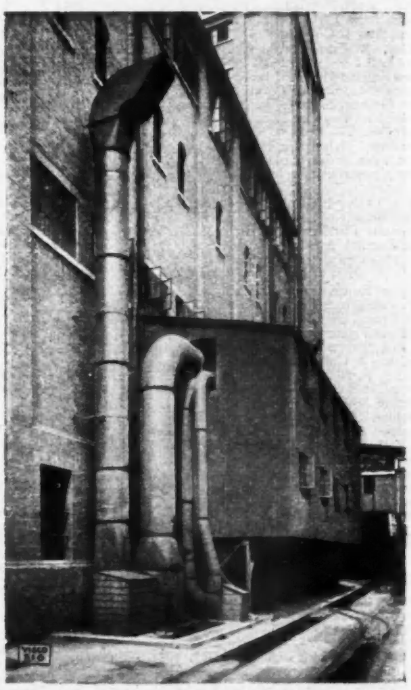

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VOL. 294 *NO. 4947* *May 7, 1958*

110TH YEAR

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something in common

They remind one of different worlds, the antique chair of 1680-1700 and the modern T.G. meter. Yet they *have* something in common — both are the products of true craftsmanship. The chair, in the style popularly known as 'William and Mary', is attributed to Daniel Marot who designed much of the furniture for Hampton Court Palace. It is presented here as a fine example of furniture design of that period and a worthy sample of the chairmakers' art. The T.G. meter epitomizes craftsmanship and T.G. 'G' prepayment mechanism is accepted as the most modern precision movement on the market.

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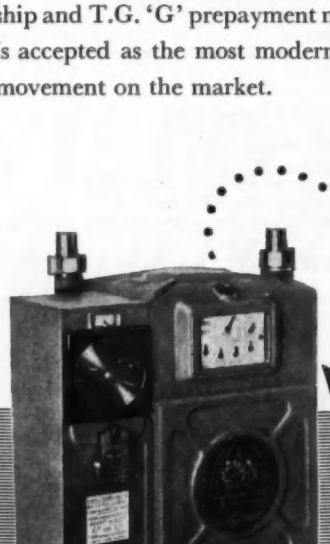

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Gas Journal

VOLUME 294. No. 4947. MAY 7, 1958. 110th YEAR

Salesmen at Leicester

THE general atmosphere at the East Midlands Gas Board's seventh Sales and Service Conference at Leicester was one of optimism. It is perhaps worth mentioning that the conference was held at the Y.M.C.A., a building which might have been thought too steeped in the tradition of sober and sombre decoration to make a suitable venue, but as in previous years the Board's exhibition department successfully ensured that any such fears were unfounded. By constructing a well designed platform decorated in pastel colours, and setting it on the stage of the main hall, the effect, by careful lighting, was that of an up-to-date conference hall, without the flashiness of the super cinema used for a political meeting.

With this background, Mr. E. H. Harman, the Deputy Chairman, who presided, was able to put over to the assembled salesmen, representing the four main divisions of the board, authorised dealers from the area, and the divisional general managers, the sales position in which the Board now finds itself. He spoke of a changing pattern in demand for certain appliances. No longer, it seemed, was the 'popular' utility cooker so greatly in demand; in fact, its sales had fallen by 8% in the last year, whereas the sales of the high grade cooker had risen by 38%. Water heating and the sales of wash-boilers were still difficult, though a fair number of water heaters had been sold during the year. The really heartening improvement was the increase in sales of refrigerators, which had gone up by 98%.

Mr. Harman thought the year ahead was full of opportunity. Describing the positive steps being taken by the Board and at management level to ensure that this would be so, he referred first to their efforts to maintain the strength of their sales staff at the best possible level and to make increases where conditions demanded it. Secondly, the Board had allocated more money for advertising and publicity in order to give greater support to individual selling efforts. Thirdly, the Gas Council, the appliance manufacturers and each board were now co-ordinating their selling campaigns so that the maximum weight of advertising and publicity would be directed to the purchasing public at selected times instead of it being done in the somewhat random fashion of the past. Fourthly, the Board, in placing in their hands the 'very fine' two-part tariff for domestic consumers, were determined to do everything possible to halt the downward trend of consumption per consumer and enable their sales staff to sell gas at a cost no greater than competing fuels. Fifthly, the Chancellor of the Exchequer had given them at least some relief from the incubus of purchase tax—a relief which would certainly make selling easier. Sixthly and lastly, they had given considerable thought to the service side. All two-part tariff consumers would now have their appliances regularly serviced without extra charge. The new 'on demand' servicing scheme for appliances and fittings which they were introducing as from that morning enabled them to treat all consumers who required service in a similar manner.

In his reference to tariffs, Mr. Harman pointed out that they were not automatically accepted by the public. It was, he said, as necessary to 'sell' a tariff as it was to sell anything else. We feel this is a point which is often insufficiently stressed. Mr. Harman put it this way: 'Our consumers do not, of course, normally work out for themselves the definite pros and cons of alternative systems of charge but, nevertheless, everybody is interested in saving money. . . . This does not necessarily mean a reduction in the amount of money spent on gas, but rather that by substituting gas for other fuels the consumer can obtain a trouble-free service at a cost which is no greater and possibly will be lower than existing costs.'

The short papers that followed Mr. Harman's address were given by salesmen from each of the four divisions, and dealt with the main problems of the sales of appliances for cooking, water heating, space heating, and home laundry and refrigeration. Under these main headings the different problems to be met by salesmen of these particular appliances were referred to, but it was noticeable how many of the problems were common to all four.

It is fundamental that where a purely domestic sale is to be made, the housewife's attention must be caught by some outstanding sales point. Wherever possible this should be done by some sort of window dressing or demonstration of the appliance in actual use in the expert hands of a home service adviser. A crowd can so easily form round an attractively styled appliance, doing all the hard work associated with, for instance, the week's washing, its operation being explained by a capable young woman who is competently making light of the whole process. Space heating can sell itself (almost) by the skilful grouping of gas fires in the showroom on a cold winter day. The packing of a refrigerator with artificial food brings home to the housewife possibilities of a lightening of her routine work. The co-operation of the local authorities in the display of hot water and space heating installations actually in use has a greater potential effect on sales, especially in districts where old property is being modernised.

The conference would not have been complete without the point of view of the appliance maker. This was supplied by Mr. A. F. Oatley, Chairman and Managing Director of Cannon (G.A.) Ltd., who stressed the need for the closest co-operation between the manufacturer and the salesman.

These East Midlands Sales and Service Conferences follow a familiar pattern, but in this case familiarity, far from breeding contempt, ensures a continuity of purpose and, we might say, an affection. Certainly we do not know any board which organises a better sales gathering with a nicer atmosphere.

Optimism at Portrush

THE closing down of small gasworks in Ireland has undoubtedly tended to give an impression of decline in the Irish gas industry in recent years. It is not a moment too soon to hear a forthright statement to explode this myth. Mr. T. McDougall, presiding at the Irish Gas Association's annual general meeting at Portrush last week, did just this. He pointed out that the truth is easily realised if one remembers that there were once more than 40 Irish gasworks with an annual make of less than 5 mill. cu.ft. Now there are none which do not make more than this quantity. The remarkable thing, Mr. McDougall points out, is that those little works were able to carry on as long as they did, not that they did eventually cease operations.

When considering this common misconception outside the Emerald Isle that there is a fading away of the gas industry there, one or two factors have to be borne in mind before making a comparison with the British nationalised industry: Of course progress has been slower, capital is very short in Ireland, as Lord Glentoran, Ulster's Minister of Commerce, remarked at the conference dinner. The other important factor is that Ireland is entirely at the mercy of outside fuel suppliers —there are no native sources. If these two problems could be overcome there is plenty of potential usage.

Mr. McDougall made it clear that where small gasworks have become defunct the lack of supplies has, in nearly every case, been made good by the introduction of butane in containers. But at the same time the larger works have been expanding. 'If I may take my own company (Londonderry Gaslight) as an example the fact is that in less than 20 years the output of gas has more than doubled. During the same period the price of gas has had to be increased until today it is twice what it was in 1939. . . coal now costs 4¼ times the 1939 price and most other costs, including wages, are over 3½ times as much as they were.'

Dr. Burns, a guest, had some encouraging things to say. Some were beginning to lose heart over the potentialities of oil, he said, perhaps referring to an unsuccessful experiment in direct gasification of this fuel, but oil gasification plants of 4-6 mill. cu.ft. a day were operating satisfactorily, making gas more cheaply than they could from coal. He also briefly mentioned the current attempts to overcome technical problems in importing methane, of which there is, of course, a limitless amount.

So that is one question that can be solved in the course of time; there is no lack of ingenuity or far-sightedness in the Irish gas industry. The other problem, that of insufficient capital, is in the lap of the gods, but when more of it starts to flow into this island of promise, so will the industries and the consumers requiring gas.

Gas Distribution Engineering

SINCE Mr. R. N. Le Fevre's original edition of *Gas Distribution Engineering* was published in 1948, there has been a period of unprecedented change and development in the technique of gas distribution. The nationalisation of the industry has been primarily responsible for much of this change, as the policy of integration adopted by a number of area boards has necessitated the shutting down of many small and uneconomical production units and the consequent linking of towns and villages by gas transmission lines and gas grids, many of considerable size. Furthermore, this policy of integration has revealed the need for standardising equipment and methods within each area; while the desirability of ensuring that such standardisation shall conform to the best practice has been, and is, fostered at national level by the Distribution Committee of the Institution of Gas Engineers.

Gas Distribution Engineering has been completely revised and brought up to date by Mr. Le Fevre, whose high reputation as an instructor of youth in the gas industry is well known, but the book claims to be more than an introduction to the subject of gas distribution practice. It deals with the general principles involved in conveying town gas from the works to the point of entry at a consumer's premises. It makes no claim to be a complete treatise on the subject, but it is a book for students and others who desire a general appreciation of the subject of gas distribution. Nevertheless, it aims at covering examination requirements for the City and Guilds of London Institute's Course in the Technology of Gas Supply and Associate Membership of the Institution of Gas Engineers. From the Foreword to the revised edition written by Sir Harold Smith, K.B.E., D.L., Chairman of the Gas Council, we quote: 'Properly used, *Gas Distribution Engineering* should materially assist in the production of the well-trained and knowledgeable technicians, the flow of whom is so essential to the future well-being of our industry.'

The revised edition runs to some 450 pages, including a detailed index, 275 illustrations and diagrams, and three Appendices giving useful information on other publications on gas distribution, various syllabuses, and past examination questions. The price of the new edition is 34s., including postage, and it is obtainable from Walter King Limited, 'GAS JOURNAL' Offices, 11, Bolt Court, Fleet Street, E.C.4.

Personal Notes

Mr. Norton-Smith.

MR. COLIN NORTON-SMITH, 30-year-old Editor of *Emgas*, the East Midlands Gas Board's monthly employees' magazine, has been appointed Public Relations Officer to the Board. He succeeds MR. PATRICK HARPER who has taken up an appointment with the National Benzole Petrol Company in London. Mr. Norton-Smith joined the East Midlands Gas Board in 1951 as Editor of the house magazine and Press Officer. Before that he was with the Watford Division of the Eastern Gas Board, where he was assistant Publicity and Sales Officer. As a member of the Leicester Publicity Club, and of the club's public speaking team, he recently won both the impromptu and individual public-speaking sections when the Leicester club met and defeated Northampton. A member of the Leicester branch of the National Union of Journalists, he is also a member of the British Association of Industrial Editors, and an associate member of the Institute of Public Relations.

MR. GEORGE DAVIES, Lincolnshire Divisional Sales and Service Manager, will shortly be taking up an appointment as Divisional Sales and Service Manager for Sheffield and Rotherham Division. Mr. Davies is taking over at Sheffield from MR. WILLIAM STEED, who has been appointed Assistant Commercial Manager with the Southern Board.

MR. S. G. DEAVES, of B.T.R. Industries, Ltd., has been re-elected Chairman of the British Moulded Rubber Hose Manufacturers' Association. MR. J. S. FAULDER and MR. R. S. EDE, both also of B.T.R. Industries, Ltd., have been re-elected Hon. Secretary and Hon. Treasurer, respectively.

SIR GEORGE F. HAMER has been presented with an inscribed silver salver in appreciation of his services as Chairman of the Wales Gas Consultative Council since its inception in 1948.

MR. BRUCE M. ADKINS, Publicity Manager of Elliott Brothers (London) Ltd., has relinquished his office at Borehamwood, and is now at the Company's head office: Century Works, Lewisham, London, S.E.13. (Telephone TIDeway 1271.) MISS J. MOSS is remaining for a short time at Borehamwood.

MR. W. ELLIOTT is to resign as Secretary of the North Thames Gas Consultative Council, and MR. CHARLES DIMMICK will succeed him with effect from July 1.

MR. THOMAS DYSON, Works Manager of the Huddersfield and Halifax Group of the North Eastern Gas Board, has retired after 50 years in the gas industry.

Obituary

MR. RICHARD W. WYVER, a member of the work study department of the South Eastern Gas Board, has died age 44. Before moving to Croydon last January, Mr. Wyver was Station Engineer at Canterbury, and Engineering Assistant to the East Kent Group.

MR. J. W. DENTON, G.M., Engineer and Manager of the Torquay/Exeter Division of the South Western Gas Board, died at his home at Paignton on May 1.

N.W.G.B. to Install Tonnage Oxygen Plant at Partington

THE North Western Gas Board will be the first gas board in this country to install a tonnage oxygen plant. The plant, which will be installed in the Board's new hydrogenation plant at Partington, near Manchester, will be capable of producing nearly 63 tons of oxygen per day.

The oxygen will be used for the partial oxidation of oil for the purpose of producing hydrogen which will be used to hydrogenate further quantities of oil in order to produce town's gas. Later, coal will be used as the raw material.

Efficiency Needed

High standards of operating efficiency are necessary for a plant of this type. The contract for the tonnage oxygen plant was placed with Air Products (Great Britain) Ltd., by Humphreys & Glasgow Ltd., who are the main contractors.

One of the major factors considered in the adoption of the Air Products tonnage oxygen plant was the oxygen compression system, which features liquid oxygen pumps for delivering the oxygen under pressure. This system dispenses with the need for stand-by gas holders, and ensures the delivery of oxygen at constant pressure, consistent purity and flow.

These conditions are essential for the efficient operation of the partial oxidation plant.

Merger Plans

Conversations are taking place between the Board of Directors of Radiation Ltd., and the Board of Directors of Parnall (Yate) Ltd. with a view to examining a basis upon which the businesses of the two Companies might be merged.

No Preference Dividend

The Directors of George Wilson Gas Meters Ltd. have decided they are unable to permit, at least for the time being, payment of the half-year's dividend on the 5½% Cumulative Preference shares due on April 30, 1958, or of the previous half-year's dividend which was due on October 31, 1957, but was not then paid.

Woodall-Duckham Ltd.

The Directors of Woodall-Duckham Ltd. announce that Group profit for 1957, after all charges but before taxation amounted to £1,264,938 (against £1,087,064 in 1956); United Kingdom taxation took £620,890 (£549,455). Ordinary dividends on capital of £1,268,889 (last year £600,000) with interim already paid of 5% (same) total 20% (25%), net amount absorbed being £145,923 (£86,250).

Diary

May 8-11.—SCOTTISH WESTERN JUNIORS: Visit to J. Stott & Co. of Oldham and Bolton Metal Products of Bolton.

May 9-10.—BRITISH GAS STAFF ASSOCIATION: Weston-Super-Mare. Annual Conference.

May 10.—EASTERN JUNIORS: Stamford. Annual General Meeting.

May 13. — COMBUSTION ENGINEERING ASSOCIATION (SOUTHERN REGION): St. Ermin's Hotel, Westminster, S.W.1. Meeting, including paper on 'Coke in Industry,' by E. Murphy, of the Gas Council, and A. S. Boyle, of Trianco, Ltd. 10.30 a.m.

May 13.—GAS OFFICERS GUILD: Recital Room, Royal Festival Hall, London. Special General Meeting. 5 p.m.

May 13-16.—I.G.E.: Royal Festival Hall, London. 95th Annual General Meeting.

May 14.—INSTITUTE OF FUEL (MIDLAND SECTION): Birmingham. Works visit and Annual General Meeting.

May 14.—YORKSHIRE JUNIORS: Huddersfield. President's Day. Visit to Gasworks.

May 19.—WEST MIDLANDS G.C.C.: Edmund Street, Birmingham. Meeting at 2.30 p.m.

May 21. — COMBUSTION ENGINEERING ASSOCIATION (N. WESTERN REGION): The Engineers' Club, Manchester. 'Grit and Dust Collecting Equipment for the Smaller Plant' by C. J. Stairmand of I.C.I., Ltd. 2.30 p.m.

New Projects Planned in Australia

NET profit of the Australian Gas Light Company for the year ended December 31 last, was £535,920 6s. 1d. the annual report shows. The amount brought forward from profit and loss appropriation account was £255,234 6s., making £791,154 12s. 1d.

Interim dividend of 3½% in respect of half-year ended June 30, 1957, absorbed £231,350, leaving a balance to the credit of the profit and loss appropriation account of £559,804 12s. 1d. Payment for the half-year ended December 31, 1957, of a dividend of 3½% on the 'A' and 'B' shares, is recommended, absorbing £251,977 19s. 1d., leaving £307,826 13s. to be carried forward.

Turning to the future, the Management is pressing on with new projects and plans for giving customers the supply of gas which they require under all circumstances. The rehabilitation of much of the Company's 6,254 miles of mains and services ranks as a top priority and will absorb a large part of the funds available in the next few years.

Work is to commence this year at Mortlake on the erection of modern trade shops to replace the existing buildings which are inadequate and uneconomical. Plans are being prepared for the systematic replacement of the telpher system at Mortlake by modern conveyor belts for handling coal and coke from and to the retort houses and coke grading plant. The telpher system was installed at Mortlake prior to the first world war, and its replacement will result in operating economies.

Equal emphasis is being placed on the search in Australia and overseas for more efficient and economical methods of handling the administrative and clerical phases of the Company's activities. An order has already been placed for additional data processing equipment scheduled for delivery in 1959, which will be invaluable in this direction.

EXECUTIVES FROM ABROAD TO VISIT GAS BOARD

SIX personnel executives from abroad —two Nigerians, two Iraqis, a Briton from Iraq, and a Briton from British Guiana—are to visit the North Thames Gas Board as part of a study tour of British industry organised by the Industrial Welfare Society.

Mr. J. M. Clare, North Thames Gas Board Staff Administrative Officer, will explain personnel procedures in nationalised industry to the delegates.

The eight-week tour is one of a series of 'group tutorials' developed by the Society to foster the exchange of experience between executives from different countries by giving them an insight into personnel, welfare, and training schemes operating in British industrial organisations.

Pictured above is the West Midlands Gas Board stand at the Birmingham Mail National Trades Homes and Gardens Exhibition. It was designed in the Board's publicity office and attracted much attention.

'Get Your Hands Oily,' Board Chief Tells Western Juniors

TO get to the top you must get your hands oily,' Mr. C. H. Chester, South Western Gas Board Chairman, told the Annual General Meeting of the Western Junior Gas Association at Bristol recently. Theoretical knowledge of machines was not enough, Mr. Chester went on. It was necessary to know how they worked, how they were put right; and any good engineer should be willing to get his hands dirty.

Officers elected for the ensuing session were—Hon. Secretary, Mr. S. W. Hayes (Barnstaple); Hon. Treasurer, Mr. J. Bowler (Bath); Hon. Transactions Secretary, Mr. R. G. Bartlett (Torquay); Hon. Auditors, R. Pratt and H. Beacham (Weston-super-Mare); representatives to serve on the S.W. Education Sub-Committee, Mr. J. B. Taylor, Mr. D. R. Jones and Mr. D. J. Maunder.

Three Council Members were elected by ballot—Mr. E. E. Taylor (Plymouth); Mr. R. D. Groom (Bristol); and Mr. D. H. P. Hammond (Bath).

At the conclusion of the business meeting the President, Mr. J. B. Taylor (Bristol) presented his address, 'Trends in Gas Compressor Design.' A vote of thanks was proposed by Mr. D. J. Maunder.

Captains of Industry?

A SYSTEM of 'tickets' as an incentive for apprentices in industry, similar to the examinations operated in the Merchant Navy, was advocated at a Scottish Management Conference held recently by the British Institute of Management.

The suggestion came from Mr. D. L. Nicolson, Assistant Managing Director of Production-Engineering Ltd., industrial consultants, who spoke to the conference on 'Leadership and Industrial Relations.'

Mr. Nicolson said that a system of 'tickets' might be developed within a firm. A man attending classes and passing verbal and written examinations could be awarded a master's, inspector's, planner's, chargehand's, or even foreman's 'ticket,' whether or not an actual appointment was made.

Cradley Heath Closes

Manufacture of gas at Cradley Heath gasworks has ceased and the works will be operated by the West Midlands Gas Board as a holder station for the storage and distribution of gas. The history of the works—a familiar sight to residents in the area—goes back more than 100 years.

Long Service Awards

Awards for 40 years' service were recently presented to 20 men and one woman by Mr. Sydney Smith, Chairman of The Scottish Gas Board.

NEW DEVELOPMENTS BY NEWTON CHAMBERS

DEVELOPMENTS in the engineering division of the Thorncliffe works of Newton Chambers and Co., Ltd., near Sheffield, are creating new capacities for production and service to modern industry. At the same time as a new stress-relieving furnace is coming into full use, an automatic welding machine is being introduced, new X-ray examination facilities have been installed, and an extended constructional shop is providing additional facilities for heavy fabrication.

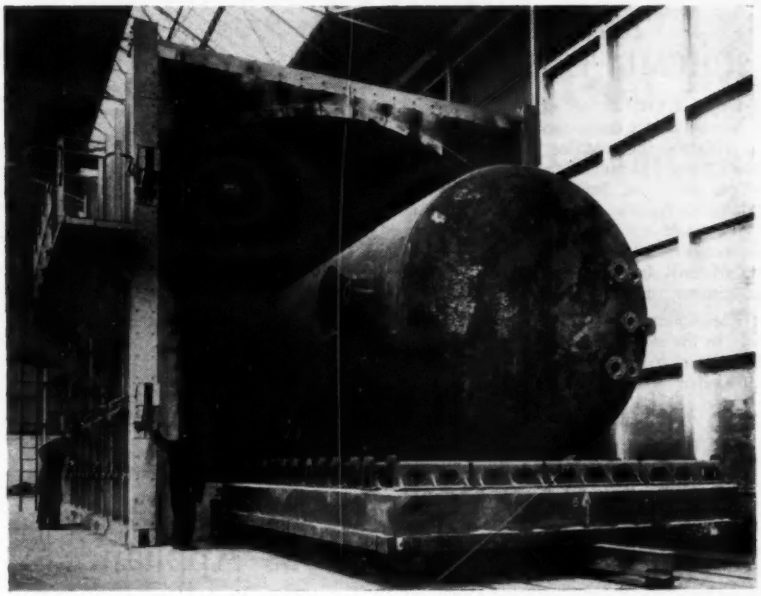
These developments are equipping Newton Chambers to meet the growing demands of the nuclear, power, chemicals, petroleum, and other modern industries. They are part of a process of continuing development by a firm which has managed always to keep up-to-date since it was established in 1793.

Though primarily for the use of the Company's own Engineering Division, linking with its Class I welding work on pressure vessels and the like, the new furnace will be available for the stress-relieving of vessels fabricated by other contractors.

This stress-relieving furnace is one of the largest in the country, the internal dimensions being 16 ft. 6 in. high by 16 ft. 6 in. wide by 35 ft. long. With a movable door at each end, it is capable of taking vessels up to 15 ft. in diameter and 100 ft. in length, with a weight of 60-70 tons.

It is gas-fired and its automatically-controlled temperature range is from 300°C., for use in curing synthetic linings, to a maximum of 1,000°C., for the heat treatment of stainless steel fabrications, etc.

The need for stress-relieving is growing in modern industry. It is essential for pressure vessels of Class I standards, and is increasingly necessary also for the removal of fabricating stresses which it is now known influence stress corrosion. The chemicals and gas industries are constantly making new demands for the removal of residual stress in vessels which must be subject to chemical processes or caustic embrittlement.



Mild steel storage vessel, with dished ends, being placed in the new stress-relieving furnace at the works of Newton Chambers and Co., Ltd.

This Newton Chambers furnace may be used also for the annealing or normalising of steel castings.

The new electronically-controlled welding plant is the Union Melt type with 2,000 amp. capacity. The accompanying manipulative equipment will facilitate the welding of vessels and fabrications up to 15 ft. in diameter and 100 ft. long.

The welding head is mounted on a cross-travel beam which is cantilevered from a column fixed in the new extension to the constructional shop. It is possible to have 15 ft. of movement on the cross-travel.

The work is carried along on power-driven bogies—two of 20-ton and one of 60-ton capacities.

There are three sets of fixed rollers and three sets of idler rollers which can be adjusted to accommodate cylindrical vessels from 2 ft. to 15 ft. in diameter. As each of these sets of rollers has a carrying capacity of 20-tons, there is capacity for a vessel of 120-tons. The rollers are mounted on a 145 ft. long track, with electric control to regulate their travel to the required welding speed.

The new machine replaces a similar prototype welding machine, with which valuable experience was gained in the welding of Class I vessels, and it is expected that with the new machine and the efficient manipulative equipment there will be improvements in both quality and production of Class I welded vessels.

New Tower Purifier Installation for Sc.G.B.

NEWTON CHAMBERS WIN CONTRACT AT COATBRIDGE WORKS

Artist's impression of the new Newton Chambers & Co., Ltd., town purifiers installation to be erected at the Coatbridge works of the Glasgow and Western Division of the Scottish Gas Board.

Summer Coke Prices

ALL 12 GAS BOARDS JOIN IN SCHEME THIS YEAR

REDUCTIONS of £1 a ton in gas coke prices came into force on May 1, with the introduction of the summer price scheme, which will operate over the whole of Great Britain. All customers taking deliveries during May and June will save £1 a ton on winter prices. For deliveries during July and August the saving will be 10s. a ton, and during September and October 5s. a ton.

The scheme was first introduced last year in the areas of ten of the gas boards. This year, it is extended to the areas of all twelve boards.

Hard Coke

The British Coking Industry Association has also announced this year's summer price reductions for hard coke. In London and the South of England, the reduction will be £1 per ton compared to present (winter) prices from May 1 to June 30, 10s. during July and August, and 5s. during September to October 31. In the Midlands, Yorkshire, the North-West, and North Wales, the reduction will be 15s. per ton from May 1, to September 30; while in the North of England and Scotland, for the first time, there will be a reduction of 10s. per ton on May 1 from present ('basic') prices, winter prices, 5s. per ton above 'basic' coming into force on October 1.

N.T.G.B. SIGNS 'TAIL' GAS CONTRACT

A contract has now been signed between the North Thames Gas Board and Mobil Oil Co. Ltd., providing for the supply from Coryton of at least 2 mill. cu.ft. per day of refinery 'tail' gas for an initial period of nearly ten years, beginning in the middle of 1959. This supply is equivalent to the amount of gas produced from 120,000 tons of carbonisation coal per year.

The gas will be piped from Coryton refinery to the Board's Romford works through a 12 in. line from the refinery into a 24 in. pipeline running to Romford.

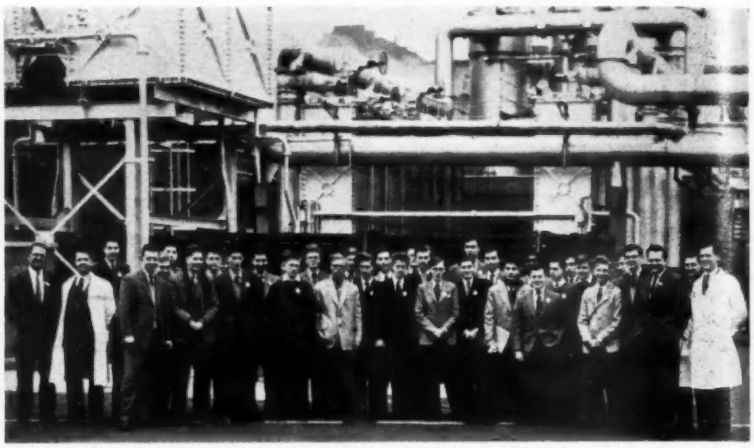
New Offices

The Audley Engineering Co., Ltd., valve manufacturers of Newport, Shropshire, have transferred their London offices from Caxton Street to 60/61, Trafalgar Square, London, W.C.2. Telephone No.: Trafalgar 4401-3.

N.W.G.B. Dealer Scheme

The North Western Gas Board have extended their authorised dealer scheme to builders who agree to display appliances on building sites under development or to distribute leaflets about gas appliances to prospective tenants.

Public Schoolboys at Litchurch



Some of the 31 public schoolboys who recently went on a five-day tour of the gas industry are pictured above when they visited the Litchurch works of the East Midlands Gas Board.

Gas Appliance Sales at Ideal Home Exhibition Beat All Records

CASH sales of 2,000 appliances, worth £74,000, were made on the Gas Council stands at the 1958 Ideal Home Exhibition, Olympia. This record total represents an increase of 30% on last year's. In addition firm enquiries valued at £100,000 are now being followed up.

On the nine stands sponsored by gas appliance manufacturers, cash orders worth £90,000 were taken.

Overwhelming Popularity

'The analysis of all appliance sales by the complete gas section confirms the overwhelming popularity of gas cookers as the housewife's choice,' says Mr. R. J. Gregg, Gas Council Publicity Manager.

'This year's combined effort was the most successful since the exhibition was resumed after the war. The public purse was noticeably much tighter, and visitors were not spending so readily. However, the introduction, for the first time, of a commission scheme on the Gas Council stands did much to ensure record sales results.'

Mobile Showroom

The Southampton Region of the Southern Gas Board has announced the schedule of parking sites and times of attendance which will be followed by the mobile showroom service which is to operate from May 12 at Milford-on-Sea, Fawley, West End, Bishopstoke, and Fair Oak. Mr. Therm's mobile service is already proving popular where already introduced.

Mr. Therm in the Hospital Ward

A DETAILED replica of a typical ward kitchen is a feature of the Gas Council stand at the Hospital Equipment Exhibition at Olympia, May 5-10.

Some of the ways in which gas helps in the preparation of hot drinks and light meals are shown. They include a hot closet, a boiler for tea-making, a refrigerator—and, of course, a water heater for washing up afterwards.

For the medical side of hospital work there are sterilisers, water heaters and incinerators. Warmth and comfort for patients and staff are provided for in the space-heaters to be seen on the stand.

FOR HEALTH—INDOORS AND OUT—GAS AND COKE

CONTRIBUTIONS by gas and coke to Britain's welfare, indoors and out, were portrayed on the Gas Council stand at an exhibition, in conjunction with the Royal Society of Health Congress, at Eastbourne, on April 28 to May 2.

Water-heating appliances, suitable not only for the home but for places where sterilising is a 'must,' featured in the show. Hospital catering problems were also demonstrated.

Then there were the gas and coke space heaters which fulfill a double role. They can keep everybody warm at home or at work—and they help to clean up the air outside.

St. Ives Closes

The St. Ives, Hunts, works of the Eastern Gas Board's Cambridge Division have ceased production.

Irish Gas Improving its Competitive Position, Ulster Meeting is Told

DISTINGUISHED GUESTS ATTEND DINNER

THE Irish Gas Association's annual meeting and conference held at Portrush, Northern Ireland, last week, had two outstandingly distinguished guests to grace its high-spirited dinner table . . . Lord Glentoran, the Minister of Commerce in Ulster and Dr. J. M. Burns, G.M., President of the Institution of Gas Engineers.

Both made some keen comments about the situation of the Irish gas industry.

The meeting was held in conjunction with the Londonderry Gaslight Company and at the conference Mr. W. R. Knox, M.M., C.B.E., Chairman of Portrush Urban District Council, welcomed the delegates. In the Chair was Mr. T. McDougall (Londonderry), President of the Association. Also extending a welcome was Colonel Sir Basil McFarland, C.B.E., Chairman of the Londonderry Gaslight Company.

Larger Units

In his Chairman's address, Mr. McDougall spoke of the tendency for smaller gasworks to give way in favour of the larger unit: 'With the passing years and continuing tendency for costs to increase the small works could not continue to provide a gas supply except at high cost and so today the number of works in Ireland is 45—21 in Northern Ireland and 24 in the Republic of Ireland.

'There is now no works in Ireland with an annual make of less than 5 mill. cu.ft. although in former times there were more than 40. The remarkable thing about them is not that they ceased operations, but that they were able to carry on as long as they did. The closing of these works, and the disappearance of the class of men associated with them, is regrettable, but at the same time it has to be said that their contribution to the gas output of the country as a whole was hardly noticeable and in nearly every case the lack of a coal gas supply has been made good by the introduction of butane delivered in containers to individual customers.

Out of Proportion

'The closing of any works, no matter how small, was always news which attracted publicity out of all proportion to the size of the works concerned and this to some extent affected all works, in that a number of people, including some who ought to have known better, took it to mean that gas was losing ground and falling out of favour. Nothing could be further from the truth.

'If I may take my own company as a typical example the fact is that in less than 20 years the output of gas has more than doubled. During the same period the price of gas has had to be increased until today it is twice what it was in 1939. That is much less than might have been expected if it is remembered that coal now costs 4½ times the 1939 price and that most other costs, including wages, are over 3½ times as much as they were.'

On relationships with other fuel industries, Mr. McDougall said that one heard of housing authorities who would exclude gas altogether from new housing schemes, presumably on the mistaken assumption that anything gas did electricity could do equally well; and that if electricity was laid on there would be neither need nor demand for gas.

'The magnitude of this fallacy is shown by the fact that when given freedom of choice nine housewives out of ten choose to cook by gas and the tenth is as likely as not to have a gas ring or rangeplate as an auxiliary to either an electric or solid fuel cooker. Any decision to exclude gas from housing schemes not only deprives the housewife of the fuel preferred by the majority, but makes both freedom of choice and competition, so desirable to ensure that both industries give of their best, quite impossible.

Goodwill

'With coal prices four and a half times what they were and gas only twice its former price it is obvious that the competitive position of gas as compared with coal has improved considerably and provides greater inducement for users to rely less on coal and more on gas for heating. As a people we are conservative where heating the home is concerned and for continuous heating, as in the living-room, the open coal fire, having outlived the original ban placed upon it centuries ago in the interest of clean air, is still first favourite.'

After criticising 'spasmodic' local publicity by the gas industry, Mr. McDougall suggested that the question of terms of payment might be looked into, from the goodwill point of view.

'We might also take a look at the methods of firms selling, say, furniture. Invariably, easy terms of payment are offered. Gas companies too offer easy terms of credit or hire purchase but with the difference that quarterly payments are called for as compared with the weekly payments to the furniture firms which long ago recognised that weekly payments were much more convenient for the customer whose budget is in most cases keyed to a weekly wage.' As the slot meter arrangement was not now practicable, added Mr. McDougall, it appeared to him that if weekly payments would help to increase sales of appliances, then weekly payments it would have to be.

The best promoter of goodwill would be a reduction in the price of gas, but anything spectacular in that direction was precluded by the high cost of coal and crippling transport charges. This was a matter of investigation at the moment and it was to be hoped that some relief would result.

New President

Mr. McDougall received the President's Medal. Mr. J. O'Regan, Waterford, was elected President for the coming year; Mr. W. H. Ainsworth was elected Senior Vice-President.

Two papers were read, one by Mr. A. E. Watkins, called 'Waste Heat Recovery,' and the other by Mr. W. S. Donaghey, was entitled 'Routine Operation of Oxide Purifiers.'

Reference to the influence of coal cost on gas price was made by Lord Glentoran when he proposed the toast of the Irish Gas Association at the dinner. He said that, in spite of having to depend on imported fuel, the gas industry had been holding its own fairly well in the line of sales, even if no spectacular advance had been made.

Over the past two years, coal from Scotland, which was the natural source of fuel for the gas industry there (Ulster), had again become available up to at least 50% of the total requirement which was regarded as the minimum between the wars. 'I am sure that this development will help towards stabilising prices, although I am only too well aware that raw materials costs are not the only concern of the industry.

Availability

'When I speak of price stabilisation I have in mind mainly what must be the sheet anchor of the gas industry—the domestic consumer. But even in the face of rising prices I feel sure that in most areas where sales of gas have slowed up due to the competition of oil or electricity, the reason will be found in availability rather than in price. But to extend availability one must invest capital which is difficult to find today.'

Lord Glentoran said that he was sure the Association were active in keeping abreast of the times methods of application which would help both industrial consumers and the gas industry itself.

'One example that I know of,' he went on, is the testing by Harland & Wolff. Ltd., of dual-fuel diesel engines designed to run on sewer gas, and normal gas has been used with great success in these tests.

'Another departure, which may not

have universal appeal, is the supply of gas to a projected crematorium.

'But on the solid industrial side I know that the Mission Manufacturing Company at Castlereagh have imposed a substantial demand for gas and that their friends and neighbours, the Hughes Tool Company, have increased their consumption.

'You will be aware that the Government of Northern Ireland have borne the cost of an experiment, unfortunately unsuccessful, in the direct gasification of oil for gas production and, while exploration for coal is proceeding systematically, no native sources have been discovered in this part of Ireland which could be of value to your industry.'

Lord Glentoran had extended a personal welcome to those members of the Association who represented the industry in the Republic.

Mr. McDougall replied to the toast.

Dr. Burns, replying to a toast to 'kindred associations and guests,' proposed by Mr. T. F. Hastings, Omagh, said that oil was taking markets away that were traditionally those of gas simply because gas was dearer. 'We would be very silly indeed if we didn't take a leaf out of their book and use oil to make gas.

'Some of us begin to lose heart over the potentialities of oil. Now I can quite clearly say that oil gasification plants of up to 4-6 mill. cu.ft. a day are operating very satisfactorily indeed—and these plants are making gas more cheaply from oil than from coal.'

On integration Dr. Burns said that was the only way they could really meet the competition from an industry that was already highly integrated. They should begin to lay their plans to combat the effect of atomic energy.

A toast to the Londonderry Gaslight Company proposed by Mr. N. J. Robertson, Dublin Gas Company, was responded to by Sir Dudley E. B. McCorkell, M.B.E., Vice-Chairman of the Londonderry Gaslight Company; 'The Press' was proposed by Mr. J. O'Regan, City of Waterford Gas Company, and replied to by Mr. P. J. Halls, Editor of the *Gas World*. The final toast was to the ladies and proposed by Mr. W. H. Ainsworth, Bangor.

During the two-day meeting members and their ladies were able to take part in bowling and putting competitions. The annual golf competition for the Association's cup took place at Royal Portrush. The winner was Mr. N. J. Robertson.

There was a bus trip through County Londonderry and visits to the Londonderry factory of Birmingham Sound Reproducers Ltd., and to the Londonderry Gaslight Company's works.

Balfour Group Build Research Centre

WORK STARTS ON £130,000 PROJECT IN SCOTLAND

WORK has now started on the new £130,000 research and development centre at Leven, Scotland, for the Balfour Group of Companies.

The main objective of this ambitious undertaking is to carry out development work for improvement in the design and operation of chemical process plant for many industries, and to widen the application, fabrication techniques, and uses of new materials of construction.

But the new centre will have other important functions. It will be available to demonstrate the application of existing designs of plant and process methods to clients' materials, to pioneer new processes and techniques, and to carry out work, without obligation, which would not justify the installation of special pilot plant by individual manufacturers themselves. Thus a confidential laboratory with semi-scale plant facilities will be available as a service. This should be particularly helpful for smaller firms.

The centre will provide training facilities in every sphere of chemical engineering. A student and graduate apprenticeship scheme has already been launched in conjunction with local technical colleges to enable suitable young men and women to reach full professional status, and at the same time to receive valuable practical training in industry.

The centre will also become the 'shop window' of the Group. By displaying examples, photographs, films, models, and drawings, it will widen the scope of the Group's diverse activities in all fields of the chemical, gas, and food industries, namely, research, development, design, purchasing, fabrication, testing, erecting, and commissioning. The seven Companies of the Group are geared to tackle any project from a laboratory reactor to a complete factory in any part of the world.

Technical design data from every source will be collected, distributed and correlated to institute an efficient library and information department.

The main pilot plant bay will be 160 ft. long, 45 ft. wide, and 30 ft. to the eaves, with a tower giving a headroom of 40 ft., but capable of expanding to 56 ft.

A separate pilot plant laboratory will deal with size reduction, with special reference to dust problems. There will be a specially isolated laboratory for solvent extraction and work with inflammable solvents and noxious gases. Here radio-active material can be dealt with in comparative safety.

In addition, there will be metallurgical laboratories, dark rooms, a corrosion laboratory, a physical chemistry laboratory, a general analytical laboratory, a chemical development laboratory, and two ceramic chemistry laboratories for the glassed steel process of Enamelled Metal Products Ltd.

The pilot plant bays will house a complete range of unit operation equipment including heat exchangers, evaporators of all types, distillation columns, high vacuum and molecular stills, vacuum dryers, spray dryers, prebreakers, size reduction units and so on.

The services provided are comprehensive, including steam at 50-300 p.s.i., water, compressed air, power, and vacuum. In addition to this, there is a wide variety of 'pots and pans' filters, pumps, screens, instruments, and other plant essential to the proper equipping of a versatile pilot plant laboratory.

Concession Granted

Bangor (Co. Down) Borough Council's staff and superannuated workmen are to be allowed to purchase gas appliances at cost plus 5%—a concession hitherto confined to officials and workmen of the gas undertaking.

Combined Meter Readings Might Save £45,000 a Year in S.W.

Possible savings of about £45,000 a year might be achieved in the South West of England alone if combined gas and electric meter readings were put into effect, it has been estimated.

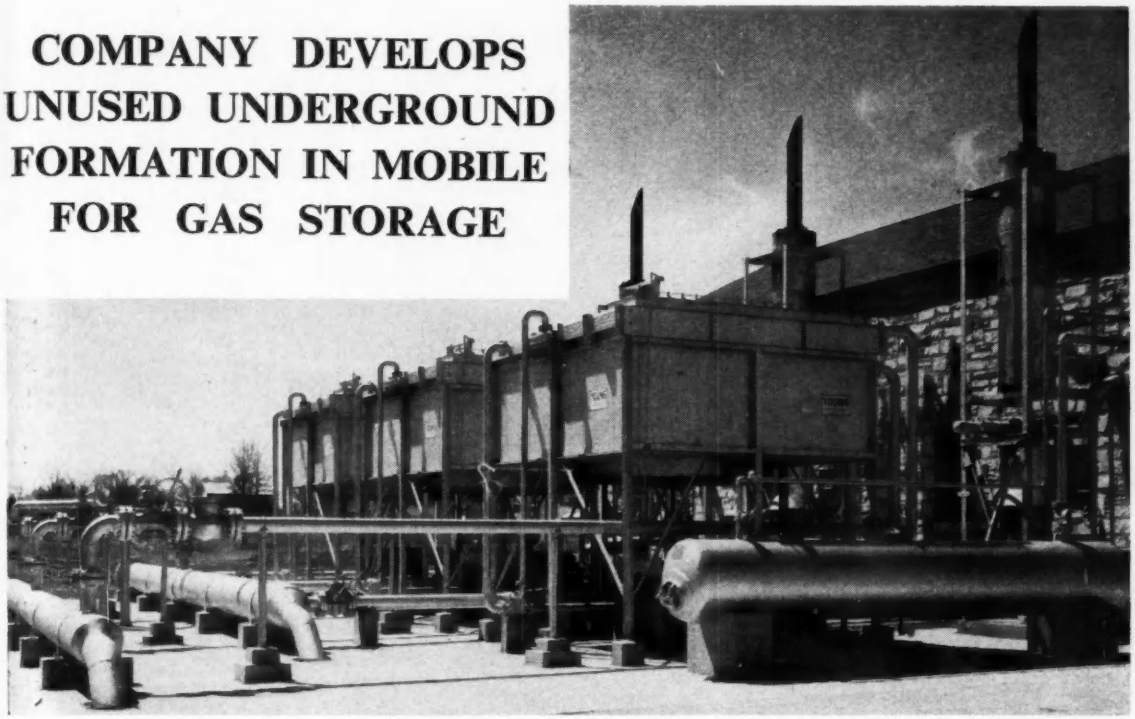
At present, wages relative to meter readings are reported to cost the South Western Gas Board £160,000 a year, while the figure for the South Western Electricity Board is £127,000. In addition the cost of transport has to be taken into consideration.

Another consideration in favour of combined billing is an estimated saving in postage of £10,000. Some 3 mill. electricity accounts and reminders are sent out each year, and the present electricity central billing office equipment, it has been suggested, could deal with gas accounts if it had more machinery.

Against combined billing has been suggested a possible loss of time and money in sending out accounts. It is also believed that some consumers might dislike one large bill instead of two smaller ones in different months.

Among other arguments against combined billing is probable extra cost of co-ordination since gas and electricity board areas differ, proportion of credit and prepayment consumers differ, and sales commission paid to gas meter readers is not paid to electricity meter readers.

COMPANY DEVELOPS UNUSED UNDERGROUND FORMATION IN MOBILE FOR GAS STORAGE



The elevated box-like structures above are fan-cooled radiators that maintain the proper operating temperatures in the gas, cooling water, and lubricating oil in the compressor station at Laclede Gas Company's underground...gas storage area, near St. Louis. Engine exhausts are piped through the station's wall and into the vertical silencers.

From HILDING H. CARLSON

THE economics of supplying gas for househeating purposes must be approached with caution by American undertakings if they are to avoid the heavy penalties of cost when peak-gas is taken from the pipelines in volumes that exceed their basic contracts with those pipelines.

The choice, in an over-simplification, is to refuse applications for new househeating service or to develop adequate storage facilities. In the larger cities, above ground storage is entirely impractical as to size and cost. The only answer is in underground natural storage areas.

The problems facing the Laclede Gas Company, of St. Louis, Mo., were typical, but the manner in which they are solving them does not follow the usual pattern of utilising depleted oil or gas structures.

There are no such areas within economic distance of the Laclede service area.

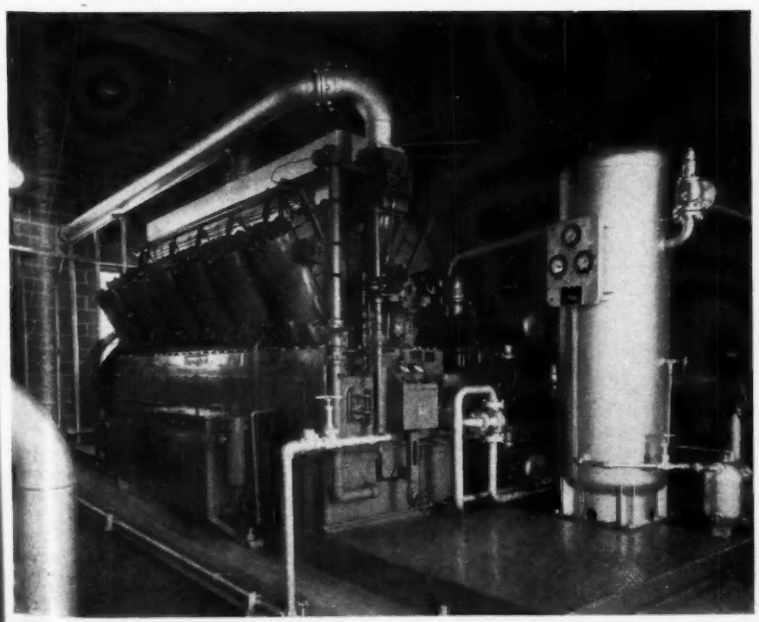
Geological explorations discovered a porous sandstone dome, 18 miles north of the city. A quarter mile below the surface, the dome was found to be sealed above and below by impervious layers of shale. At the circumference, the seal is salt water. Extensive probing, which started in 1953, covered 25,000 acres and proved the character of the underground zone.

The first deep test well struck oil at 950-ft. Oil was of no interest, so the well was continued to 3,240-ft., at which point it had passed through the entire sedimentary phase. St. Peter sandstone was found at 1,450-ft. in a 100-ft. stratum that was judged to have good porosity and permeability.

Hydrostatic tests established that there was no communication between the sandstone and the cap rock.

The Laclede Company negotiated leases for storage rights, stipulating that no minerals would be produced and that no potable water strata would be used. Construction of the injection wells and a compressor station were started in early-1955. The first gas was injected during the following December.

During 1956 and 1957, a total of ten



Seen left is one of the three Type SVG ders, with 11¼ in. bore and 12-in. stroke. the Laclede compressor station showing the V-arrangemnt of the 12 power cylinders, with 11¼ in. bore and 12-in. stroke.

wells were drilled into the sandstone structure. Ten additional wells are contemplated.

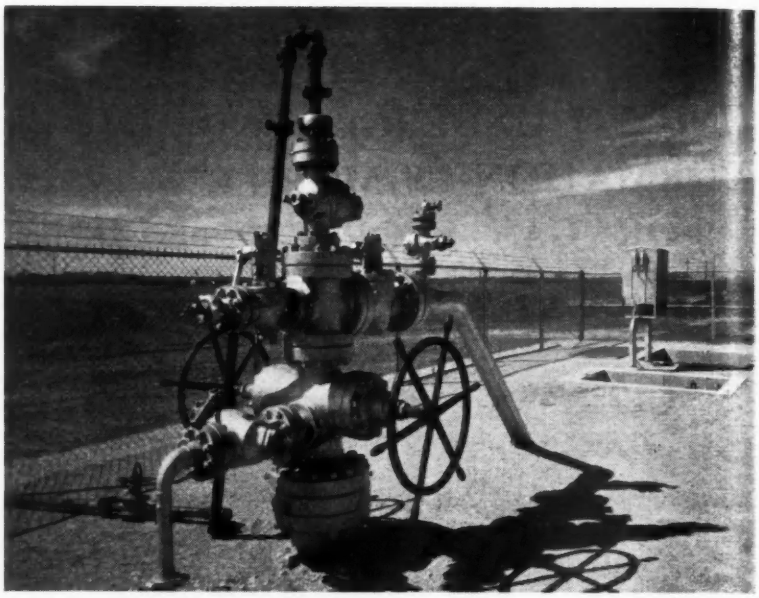
With 100,000 househeating customers, the Laclede undertaking was then in a position to look favourably at the 100,000 *unfilled applications* for the same service. Geologists had estimated that the capacity of the storage zone is in the order of 50 mill. cu.ft.

When the storage area is in full operation, deliveries of gas from a long-distance pipeline can be taken continuously at or close to the volume specified in the purchase contract. As customer-demand is below that volume, excess gas is put underground in the storage zone. When demand rises above the contract volume, gas is withdrawn from storage—to meet the demand without payment of the contractual penalties.

Injection of gas to the storage structure is at the rate of 16 mill. cu.ft. per day, with discharge pressure from three Ingersoll-Rand gas engine compressors at 655 lb. per sq. in.

Each of the Type SVG compressors has 12 power cylinders, with 11¼ in. bore and 12-in. stroke. Two compressor cylinders, in the first stage, are 10 by 12 in.; two second-stage cylinders are 5½ by 12 in.

Gas from the long-distance pipeline delivered to compressor station passes through a scrubber and then through a recording orifice meter and to a 24-in. intake manifold. Eight-inch lines from the manifold take the gas through secondary scrubbers before discharge into the first-stage compressor cylinders. A fan-cooled radiator lowers the gas temperature before it passes into another scrubber and on to the second-stage compression.



This complex of fittings, valves, pipe, bolts-and-nuts, directly above a gas injection well in the Laclede storage area, is called the 'Christmas tree.' There is one at the top of each well. The upward slanting pipe, right, carries scrubbed, cooled, and compressed gas from the station building to the well.

A second cooling-pass and the gas goes into a 6-in. line that manifolds in a 20-in. line to the injection well.

Fuel gas for the engines, of course, is taken from the incoming pipeline gas.

The first sustained operating withdrawal was 80 mill. cu.ft. in six days. Gas is withdrawn at 150 lb. per sq. in. and passes through a gas-fired heater that maintains a discharge temperature of 70°F.

The successful development of this underground storage zone by the Laclede Gas Company provides the facility on which the undertaking will be able to expand its gas sales to all classes of customers—not just the househeating class.

Competitive Position of Gas Highlighted in U.S.

THE competitive position of gas in the United States has never been shown more emphatically than in a report just prepared for the American Gas Association, using three plans of service from gas and electric undertakings.

A standardised military housing project with 1,000 family-units was used as the basis for studying the competitive positions in 35 cities throughout the country. The choice was made because a new housing programme for the military bases has been estimated to account for 7 to 10% of all housing to be built in the U.S. during 1958. The military market has been characterised as the most concentrated and competitive single market for gas service and gas appliances.

The report to AGA noted that if a 1,000-unit project were to use all-electric service, the average annual cost would be 188% higher than if it had used all-gas service. The electric heat pump's performance has not come up to expectations and its operating economics compare unfavourably with gas economics for the same service.

In the standard military housing project, there are 700 two-bedroom units and 300 three-bedroom units.

In the 35 cities that provided the nationwide comparison, undertakings' gas tariffs ranged from 1½d. to 11½d. The electric tariffs had a shorter range, from just more than ½d. to just more than 1¼d.

Gas for cooking in a national average for the 1,000-unit project would cost £1,164 5s. 8½d. per year, according to computations in the report to AGA.

'The cost of electricity for cooking and water heating is extravagantly high,' the report commented in making the comparison. For service equivalent to gas service, the electric cooking cost would be £7,564 19s. 11½d.

In a further breakdown, water heating with gas was found to have an annual average cost of £2,426 15s. 8½d. The extravagance referred to is seen more sharply in the comparable cost of electric water heating: £19,833 18s. 6d. annually.

Three 'plans' were applied. In Plan 'A' the calculations in the report assumed utilisation of gas for cooking, automatic water heating, space heating for the winter, and cooling for the summer. Electricity would be used for lighting, small appliances, refrigeration, and the furnace fan.

In Plan 'B,' a combination of gas and electric utilisation transferred the summer coloing operation from gas to a conventional air conditioning system. All other gas functions would be utilised.

In Plan 'C' there was no gas consideration. All operations were electric; the heat pump was assumed to provide winter heating and summer cooling.

The three plans, when applied to the existing tariffs of the undertakings, produced a considerable range of costs. In a selection of 13 cities from the list of 35 the all-gas plan—'A'—showed a coast-to-coast range of from £36,080 12s. in Denver, Colorado, to £103,290 12s. in Hartford, Connecticut.

All-electric installations—Plan 'C'—had a cost-spread of £75,324 5s. in Dallas, Texas, and £140,563 4s. in Worcester, Massachusetts.

Percentage-wise, the excess cost of all-electric over all-gas ranged from 9.2% in Newark, New Jersey, to 110.0% in Denver. In the full list of 35 cities the excess cost went as high as 198.3% in Shreveport, Louisiana.

The comprehensive report, AGA comments, answers the gas industry's long-felt need for authoritative criteria giving the correct amounts of gas and electricity required for household purposes. From this report, it is now possible to estimate service costs in advance by applying the prevailing local undertakings' tariffs to the known amounts of energy required.

From a paper to the Midland Junior Gas Association, March 4.

Electrical Economy in Gasworks

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WEST MIDLANDS GAS BOARD.

THIS paper is not concerned with the economics of the use of electricity as against other fuels, but accepts that large-scale electrification has taken place and is still proceeding in gas works. Its intention is to survey the investigations and developments which have been carried out over many years in the Birmingham Division of the West Midlands Gas Board to maintain an effective service in electrical operation at the least cost in capital and operating expenditure. In this Division the Divisional Electrical Engineer is responsible to the Divisional Engineer for the effective operation of all electrical plant in all gasworks and Board buildings in the Division. His staff undertakes the specification, provision, installation and commissioning of all electrical equipment necessary for the operation of new gas-making plant and also the maintenance of existing electrical equipment on a planned maintenance system. The works' power houses are supervised by attendants who operate the turbo-alternators and undertake switching operations when necessary.

The general electrical scheme is basically similar in each of the Birmingham works. The incoming electricity supply from the electricity board's network is accepted at 11,000 V at one or more points, and transformed down to 440 V, three-phase, with earthed neutral. Where generation is undertaken from turbo-alternator or asynchronous induction generator drawing steam from the works system, the sets are synchronised into the medium voltage system. In the substations and power houses medium voltage oil-immersed switchgear protects the outgoing armoured cable feeders which radiate throughout the works area. Each individual electric motor drive with its own isolator and starter equipment receives supply from short armoured cable legs solidly tee-jointed to the nearest works feeder. The majority of the motors are totally enclosed types with direct-on-line automatic contactor starters and manually operated fused switches enclosed in heavy cast-iron cases with sponge rubber gasketed joints. Some individual plants within the works are equipped with specially designed heavy duty multi-motor control panels completely sealed against the ingress of dust and protected against corrosion, and these are fed directly by the feeder or solidly tee-jointed to it with the necessary high rupturing capacity fusegear to give short-circuit protection. Power at 110 V for the general lighting system is taken from 15 kVA double wound oil-immersed transformers which take a supply from the radial feeders.

Gradual Modification

With a connected electrical load of about 32,000 H.P. it is not practical to carry out mass alterations and adjustments, so with a view to reducing costs, modifications to materials and methods must be introduced gradually and their effect watched to ensure that reliability of the service is retained. Standardisation of material in any big organisation is now universally accepted as a basic economy in which a few well tried units are used to undertake a large variety of duties, and each installation, instead of being tailor-made for its duty becomes a compromise. Having set the scope of standardisation, it is essential that the items are purchased at the lowest possible cost. The items must be minutely specified and, if practical, adjusted to come within the capabilities of as large a range of manufacturers as possible. Central purchasing would appear to offer the best means of providing the widest possible enquiry and best discounts for material. It is always possible to find some manufacturers who can supply material cheaper than others, but provided technical supervision is maintained on the product supplied, the greatest advantage of low price under standardisation can be attained.

The gas industry demands continuity of electricity supply which calls for a very high level of reliability from main and distribution switchgear. The last ten years have seen a great increase in new gas-making plant, and the enlargement of existing capacity. Quite often, new developments have been incorporated in current contracts, resulting invariably in modifications, and usually additions, to the electrical scheme. In the Birmingham Division, all the switchgear on medium and high tension networks is of oil-immersed type and very rarely runs continuously at over 80% of its normal rating. It is probable that considering the location in which this switchgear operates that the oil immersion has provided a very necessary protection to the switch parts, but with the modern conception of proper substations and pressurised switch rooms air break equipment for medium tension duty will gradually replace this equipment. Where old type switchgear is not heavily loaded but has insufficient short circuit rating, back-up HRC fuses are fitted to obtain 25 MVA rating, as a convenient means of extending the life of such equipment. In the smaller works manually-operated fused switches are in use as main distribution switchgear.

Lead covered, paper wrapped, single steel wire armoured and overall served cables are in use in large quantities throughout the Division. Sizes above .1 sq. in. conductor cross-section are paper insulated and the smaller sizes vulcanised rubber insulated. A paper insulated cable is approximately 30% cheaper than its rubber insulated equivalent, and investigations are at present in hand to use mass impregnated non-draining type paper insulated cables with simple cold compound terminations, which, it would appear from the results so far, that considerable possibilities exist in this field. The use of polythene and polyvinylchloride insulating tapes has now become standard practice on cable terminations, where hot compound is not used.

Enclosure of Motors

Experience in chemical works has shown that where motors are subject to abrasive dust total enclosure is essential. The size and general development of the Birmingham works have allowed the gradual standardisation of direct-on-line starting, and the introduction of BS 2083 in 1954, concentrated the motor manufacturers on a range of standard dimension squirrel cage induction motors up to a maximum size of 20 H.P. at 1,500 r.p.m. synchronous speed. For gasworks use it is essential to provide the terminal box with gaskets and felt shields to prevent the ingress of coke dust along the shaft into the bearings. The acceptance of motors with single running speeds and the provision of fluid couplings to reduce to a minimum the length of the starting time under which six to eight times full load current is experienced is now standard practice in this Division and in the few cases where a degree of speed variation is required, a scoop controlled fluid coupling has normally been provided. The cost per horse power of these motors is shown in relation to previous standards in Fig. 1 and it can be readily seen how necessary it is that this British Standard range should be extended up to 50 or 60 H.P. as soon as possible.

Although this standard dimension motor is produced by all the motor manufacturers, considerable variation is found in the cost of particular sizes within the range.

Over the past years it has been found that in order to obtain reliability under the severe dust and corrosive conditions within the larger part of the works, it has been necessary to downrate the manufacturers' capacity for control gear and fuse switchgear and to provide this in special heavy cast iron and gasketed enclosures. In the Birmingham Division a range of three sizes of specially built direct-on-line contactors suitable to operate all sizes of squirrel cage induction motors up to 60 H.P.

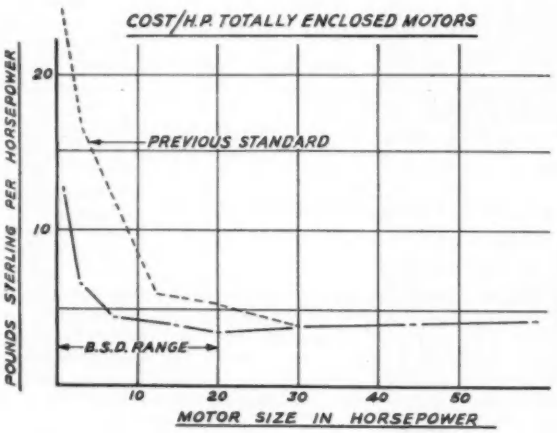

Fig. 1.

was introduced. The cost of these starters per horse power compared with general heavy duty industrial equipment available on the commercial market is shown in Fig. 2. For the motors of smaller horse power, however, the cost of starting equipment was very heavy, and over the last three years a smaller size starter of industrial pattern, modified to provide the necessary sealing against dust, has been introduced for 1 H.P. and 3 H.P. motors. Where individual new plants were installed with their own group of motors, the development of special heavy duty thickly gasketed multi-motor group control panels took place. In Fig. 3, the cost per H.P. connected is shown against the connected motor H.P. for such panels suitable to accommodate from 15 to 40 motors, and it can be seen that with a connected motor load of 2,000 H.P. the cost of such a panel will be about £6.1 per H.P. These panels were originally designed to withstand extreme gasworks' conditions, but it was found practical to house them in small substations or switchrooms. This gave a partial relief from the severe conditions and the possibility of using less special equipment. In this way the field was opened for more manufacturers to become interested and competitive tendering has reduced the cost, on the range shown in Fig. 3 by 25%. This modified form of panel is now undergoing operating tests. If the cost is to be brought still lower, it only remains to include more equipment

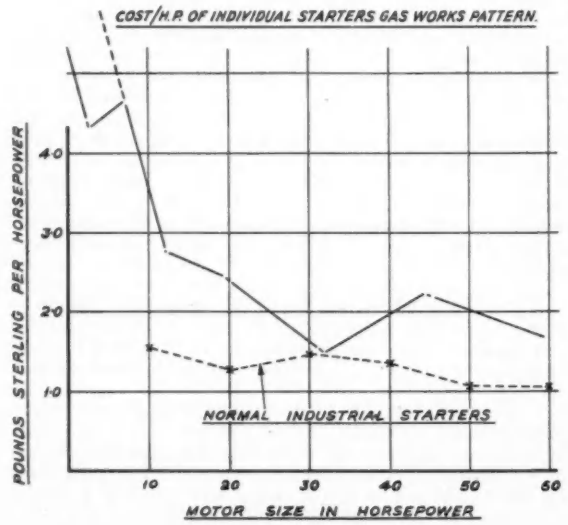

Fig. 2.

in each cubicle and to increase the rating of control gear so that greater horse powers can be controlled from existing size cubicles. This the manufacturers are being pressed very strongly to do.

Severe Lighting Conditions

The lighting installations throughout gasworks need to be able to stand up to the severest conditions to be found anywhere. The resetting of a vertical retort bench gives a limited life of about 12 years to each lighting installation in the retort house. Within this period the component parts are subject to conditions of heat, vibration, dirt and moisture from the gas-manufacturing process, voltage variation from the electrical system, and incorrect lamp positioning from design of the retort structure. The weakest component in resisting these conditions has proved to be the electric lamp itself. A tungsten filament general service lamp which conforms with B.S. No. 161, 1956, will give its rated lumen output over 1,000 hours of life provided it is burnt hanging vertically downwards under strict conditions. Since these conditions cannot be met, lamps with a special filament construction, operating from a 110 V system, are employed throughout the Birmingham Division. Though this voltage is employed primarily as a matter of safety, it also discourages the stealing of lamps. At the same time it gives a more robust lamp filament and a greater light output than the 240 V type.

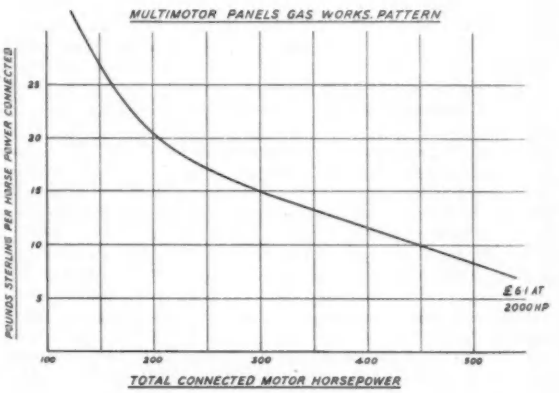

Fig. 3.

Compared to the standard 240 V lamp, the filament wire in this special lamp is of larger diameter since it is wound on a larger mandrel to give a larger diameter filament coil of approximately the same length. The lamp is gas filled and this filament presents a larger effective surface area to the gas which causes, by increased cooling, a reduction in filament temperature and an increase in its life, though at the expense of a slight drop in light output. The loss of light output, however, is not considered a serious disadvantage, since observations in the works have shown that when a wellglass type lighting fitting and lamp installed on a charging stage are cleaned, the light output falls about 20% within the first four to six hours as the dust settles and thereafter remains fairly constant over a considerable period of days.

Lamp Purchases Fall

In 1955, when the total purchases of lamps by this Division was some £2,723, the new lamp was introduced and by the beginning of 1956 the conversion was complete. Lamp purchases in 1956 had fallen to £1,888. The number of lighting points and size of lamps in use are continually increasing, and although the quantities in stock may have varied slightly over these years, a considerable part of this £900 saving must be credited to the success of this lamp. Mercury discharge lamps of 125 W for interior use and 400 W for yard lighting are in common use in this division but the colour of the light does not make them popular with the operators. A very limited use has been made of the 140 W sodium lamp in street lighting

lanterns for exterior and interior use. In spite of the colour, and provided complimentary colour paints were used, it would appear that there was a considerable field for experiment in this line.

The maintenance of lighting intensities as far as lamp replacements and cleaning lighting fittings is concerned, is carried out by unskilled labourers, who mostly find ladder climbing difficult and fixing screws on fittings a disadvantage. Because of this, the 200 W wellglass type fitting with porcelain top and screwed glass is in very common use. These are fixed horizontally or vertically upwards and downwards on any fixing surface within a maximum of 10 ft. from the ground or access platforms. Aluminium bulkhead fittings with Edison screwed lamp holders capable of enclosing 150 W lamps are also in use. The smaller 60 W size has been discarded since it has become the practice of putting in a 100 W lamp and leaving off the glass enclosure. Metal dispersive lighting reflectors with vitreous enamel finish are used in very limited quantities. When used, they are preferred if they are fitted with glass visors to exclude dust, and fixed only in places where ladder access is reasonable.

Electricians Directly Employed

In this Division, electricians and mates are directly employed to carry out all new installation work, a practice which allows a very high degree of control of the economy of the installation. To achieve high quality in the installation of complicated electrical equipment demands first-class craftsmanship and technical understanding on the part of the electrician. So often, the benefits of good design and the use of special equipment at extra expense are wasted because the installation staff have left cover plates loose, with connections badly made and conduit entries left open. It is normal practice for the training of the new generation to be undertaken by the existing craftsmen. In this Division an indentured apprenticeship is run for approximately 18 boys who wish to become electricians. Every effort is made to enlarge the scope of training with special demonstrations, and visits to manufacturers' works, but as yet no direct tuition is given by the department. The electricians and mates, though normally engaged on installation work, are withdrawn periodically to undertake maintenance on a planned maintenance scheme referred to later, and no distinction is made between installation and maintenance staff. This procedure ensures that lessons are learnt very quickly from faults arising from ineffective installation work. The output of work from such men is a common matter of concern to most employers. This is usually due to indifferent organisation and, since work study cannot yet be applied to this class of labour in this Division, present efforts are being concentrated on foreman training to improve the organisation and preparation of work to eliminate wasted effort and time on the part of the workman. The services of wiring contractors are used in this Division on work of which the location gives rise to transport and supervision difficulties or on which material is employed which is not normally stocked under standardisation. In nearly every case such installations are only undertaken against a rigid specification and after competitive tendering by a number of contractors.

It is essential that rigid inspection is exercised not only on completion, but during the work if the original intention of the design is to be achieved. In most cases this control and inspection falls to the foreman. The quality of this man in carrying out his work is of prime importance, not only in obtaining quantity of work from his men, but quality as well. The completion of inspection must culminate in the commissioning of the equipment. Maintenance inspections would normally be carried out soon after equipment has gone to work to confirm that its design conditions are maintained. Failures early in working life due to poor commissioning can be very expensive, since not only do they require special attention to rectify, but continued maintenance inspections make certain that they do not re-occur.

Many papers have been written to justify planned maintenance systems, and most large organisations have now accepted the advantages that can be gained from such schemes. In this Division such a scheme has been in operation since 1950 and now covers some 4,100 electric drives. Originally, ten auxiliary plant attendants were employed to inspect and clean all items of each electric drive, and a group of three attendants could normally inspect all drives on a works in a period of about two to three months. Variations of this system were introduced, whereby more essential drives received an increased number of inspections, while non-essential plant received less attention. The number of auxiliary plant attendants has, however, now reduced to three and the system is now built around the craftsman electricians undertaking the maintenance inspection normally plant by plant. Besides this system, an emergency electrician and mate are employed throughout the 24 hours to attend to such electrical faults as may arise on any of the three main Birmingham works.

All high tension and medium tension distribution switchgear is inspected internally about once a year, or inspected immediately after tripping on heavy load, or where overheating is suspected. The oil in power transformers is sampled every six months and acidity and insulation breakdown tests taken under laboratory conditions. Where the insulation breakdown voltage is shown to be falling into the region of 22 kV, the next suitable opportunity is taken to hot filter the oil to restore a 40 kV reading. Where high acidity is present it is normal to replace the oil entirely when the value of 2 mg. KOH per g. is reached. Apart from the routine inspections by the three auxiliary plant attendants and the inspections by electricians normally by plants already mentioned, the maintenance system is supplemented by special concentration on cranes, lifts and battery-operated coke chassis. Any defects found are normally corrected by the Board's staff from material held in stock. Where defects occur on motors, the motor is replaced from stock, or passed to local contracting repair firms who give 24-hour service. In many cases where these services are available it is unnecessary to maintain spare motors for drives since the work of repairing a motor can often be achieved in little more time than required to change a unit.

Poor Alignment

Where fluid couplings are in use it has been found essential to obtain alignment within .005 in. Much of the wear in motor bearings may be attributed to poor alignment on such drives. Further, when a motor has been subject to mechanical vibration and is conveniently released from service the opportunity is often taken to change the bearings before the motor is put into service again. At each works a number of unskilled lamp cleaners are employed to keep lighting fittings clean and replace any lamps which have failed. This service is supplemented periodically by electricians and auxiliary plant attendants who will repair broken fittings, lampholders, and maintain the fuseboards, transformers and switchgear. On the main gasworks there are approximately 6,000 lighting points and some 10,000 lamps are used every year as replacements.

Electrostatic detarrers are normally inspected internally once a year, while a watching brief is continually kept on detarrer performances by the works' chemical staff using the tar fog camera. Experience has shown that efficient detarring gives trouble-free operation. The sets are run at 8 to 10 mA per mill. cu.ft. of gas daily flow for cold gas streams, and 10 to 15 mA per mill. cu.ft. daily flow for hot gas streams; the values of rectifier input and output conditions are noted every six months where a rectifier is giving over 75% rated output to ensure that no excessive ageing is taking place. Where sets have open insulators, these are cleaned externally about every two months, consistent with surrounding conditions.

The effectiveness of the type of equipment, method of installation and maintenance detailed above can be measured up to a point by the number of electrical faults which are reported for attention each year. During the year about 3,500 faults are reported for attention at the three main Birmingham works. During winter months their number rises to about 400 a month, and falls in the summer to some 200 a month. Faults range from the trivial, a lift gate left open preventing the lift from working, to the extreme cases of a motor burn out, or a works feeder damaged and may be allocated as follows:—

- 20% Lighting faults.
- 40% Faults on cranes, hoists, lifts or battery-operated coke extraction chassis.
- 20% General electrical faults, failure of insulations, etc.
- 7% Failure of equipment due to mechanical fault or incorrect adjustment.
- 6% Incorrect starting up or operation by operator.
- 5% Equipment shut down due to overload operation, no reason traced.
- 2% No fault found, equipment working when visited.

Since mechanical defects are directly responsible for some 7% of all electrical faults reported, and often mechanical misalignment and incorrect adjustment contribute to many of the electrical difficulties, the level of mechanical maintenance is extremely important, if these faults are to be reduced. The total number of faults reported has shown a tendency to decrease by about 150 a year over the last few years. This may be due to the gradual improvement in the standard of the equipment and the slow replacement of old installations, since the number of maintenance inspections has been substantially reduced. Originally there was a full works inspection about every two months but this period has now been extended to between six and eight months.

The use of electricity on any gas-making plant must be controlled by the terms under which this electricity is supplied by the local electricity board, or generated on the works. Since no works in the Birmingham Division is self-sufficient in its own generation of electricity, all receive electricity from the Midlands Electricity Board at tariff No. 7, for bulk supplies. The terms of this tariff are briefly that the supply is metered on a trivector meter recording maximum demand kVA and units used throughout each monthly period. Where two or more H.T. supplies enter a works, the maximum demand kVA for each supply is summated on a single meter and the summated kVA of maximum demand charged with the units over each monthly period.

Maximum Demand Charge

At the charges operating from April 30, 1957, the maximum demand charge in any month shall not be less than £4. Where generation of electricity is undertaken at a works, the four winter months, November, December, January and February are taken together for kVA of maximum demand purposes. An adjustment charge per unit is applied controlled by the increase in the price of coal, and at present this represents an additional charge per unit of .2d. The electricity board tariff was designed to encourage its consumers to increase their consumption of electricity for a given level of kVA demand. If the consumption of electricity under this tariff exceeds 365 kWh (units) for each kVA of maximum demand, *i.e.*, a 50% load factor, the overall cost of the electricity is less than under the previous tariff. The raising of the load factor for any works therefore is of prime importance if the overall cost of each unit of electricity is to fall. The daily load factor of a works can be as high as 80%, but spread over a month this figure will fall to about 40%. The decrease in the overall cost of each unit of electricity consumed will depend on the following factors.

(*a*) The reduction in a 'peaky' demand and the even spreading out of the consumption of electricity over the 24 hours for each day of the month. It would be necessary to control the time of operation of each plant and operate to a rigid schedule. Although it is practical to defer the running of certain plant to times of least demand of electricity, the interference with long standing terms of employment of operators makes such a large-scale course difficult.

(*b*) Direct saving of electricity consumed and restricting of kVA demand at peak periods by shutting down plant and electrical apparatus which is not required for the basic well-being of the process of working conditions. This economy in operation depends entirely on the conscientiousness and quality of training of the operators and supervisory staff.

(*c*) The decrease in kVA of maximum demand for a given consumption can be undertaken by improvement of the power factor of the works system.

Electrical power losses are caused by the large amount of iron surrounding the wire coils in motors and transformers in the electrical system so that only a part of the current demanded is used in providing the power output of the system. The ratio of this part of the current to the total current is an expression of power factor. The nearer the value of the current necessary for actual power output approaches the total current, the nearer the power factor approaches unity and the smaller will be the kVA demand for any given power consumption. The standardisation of the use of certain size motors for all purposes on a works results in many motors not running at full load, and it is common practice to connect to the system static condensers or over excited synchronous motors as a means of compensating for the resultant low power factor. It is generally accepted that the economic limit for power factor improvement is about .92 lagging. Power transformers are normally looked upon as items of very high efficiency, and it is not always realised the effect they may exert in producing a low power factor when run on light loads. During the summer months in this Division, where power transformers in parallel support the same works loads and wherever it is practical, one transformer is taken out of service to maintain a reasonable load on the other and to assist in maintaining the power factor at a satisfactory level under low load conditions.

The rôle of the works generator over the past years has completely changed with the growth of the electrical load at the works. So long as the electrical load was within or near the capacity of the generator, it was looked upon as the 'essential' supply to the works should the incoming supplies from the local network fail. At that time the electricity board's supply was not considered reliable or continuous enough for the gasworks process, but with the growth of load which has far exceeded generator capacity, and with the provision of more than one supply from the electricity board, the present reliability of supply has been grudgingly accepted. Today, even the poorest grades of solid fuels have a commercial market, so their use for steam raising in a gasworks solely to generate electricity can seldom be justified economically. Steam generation from the process, *i.e.*, from waste heat, must therefore form the source of electricity generation. Where low pressure process steam can be absorbed continually, it is modern practice to generate high pressure waste heat steam for use in pass-out turbines driving alternators with a condensing section to absorb the steam surplus to works requirements. Where the two features are required, it would depend on the conditions at the works, whether a single turbine incorporates the pass-out and condensing facilities or whether two separate sets are used. The electricity consumption of a works can be reduced to two components, the first a base load block of 100% load factor, and the second a 'peaky' figure of low load factor. The cost of importing units of the first component is about 1d. per unit, while the second component costs over 1.5d. per unit, the combination of the two giving the overall works unit cost.

Availability of Works Steam

Where works steam is available for generation, it is normally a continuous supply and the generator runs continuously. This base load generation is therefore replacing a portion of the cheap block units, and it is doubtful if generation on a works scale could achieve such a low cost per unit. Generation of electricity under these conditions, therefore, becomes a by-product and is a convenient way of absorbing surplus steam energy. Generation of electricity to replace the imported energy of the second component may well be a sound proposition provided that a diesel generator is used. If, however, steam were used the intermittent demand would interfere with the steam operation of the works.

With the sectionalisation of the electrical system in a large gasworks, it is important to ensure that where works' generated power is fed into the system, it shall be wholly absorbed at all times so as to prevent electricity being imported into one section of the works on one supply feeder, and exported over another to the electricity board's network. This is particularly important since the trivector meters will only record imported electricity and will take no account of the export. Where substantial export of power may occur, the electricity board fit special meters, but only offer a third of the value charged for imported energy. Means must be made available, therefore, to transfer works loads between feeders to fully absorb power generated at the works at all times. Where continuous electricity generation is undertaken and steam from the same works supply is used for prime movers and process work, shortage of steam may jeopardise the output of gas. This should be met by the conserving of steam from unessential uses, and not by shutting down the alternator set. Interference with power generation for a short period will decrease the monthly load factor of the works and increase the cost of the electricity imported. Such a course on a Birmingham works can cause a 15% increase in unit charge.

The economies effected by the use of electricity cannot be measured only in the cost of its use and the equipment installed.

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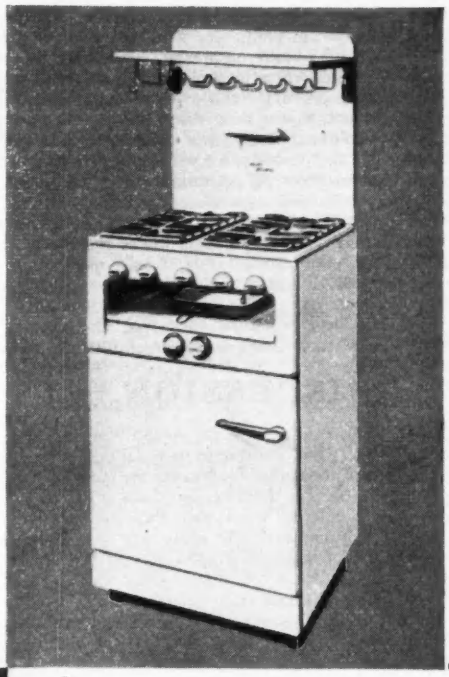

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Its employment to assist other techniques must also be considered. Work study is now playing an ever-increasing part in simplifying duties and making more effective reduced staffing at each plant. Such developments demand a centralised control and a remote operation of plant. To achieve these, the present practice in interlocking and sequence operation must be reconsidered. With reduction in staff much plant will operate without any supervision, and failure of a single interlock or sequence arrangement would then result in far more serious consequences. Additional safeguards would be necessary so that, with failure of any part of the control system, other circuits would ensure continued correct operation. This would give an opportunity for repair and maintenance of the faulty parts. Furthermore, much of the equipment would be controlled remotely and started without warning. It is most important, therefore, that the maintenance staff should use a comprehensive safety procedure and that audible alarms give warning before any plant is started. The field of electronic control over the past few years has expanded very fast, and many such applications have already been used successfully.

DISCUSSION

Mr. D. J. O. Bath, President of the Association, opening the discussion enquired what additional precautions were taken against the failure of the radial feeders on the works. The use of electricity at 110V for lighting he thought a very good proposition, but wondered what was the voltage used for mercury vapour lighting, and why there was no reference in the paper to the use of fluorescent lighting. On page 17 of the paper, he said, there was a reference to the testing of oil in power transformers and asked why the test samples were taken from the bottom of the transformer after oil had run to waste and wondered what quantity of oil was run off in this way. Plant maintenance, he considered, had been very well dealt with in the paper.

Mr. S. Brockbank (Newcastle-under-Lyme). As to the use of 110V lighting, he wondered if this was safer than a 240V system. He asked Mr. Bryan if he favoured multi-motor starting panels and expressed some doubt as to whether when motors were started well away from their starting panels, the saving of time by so doing was justified. He asked whether young electricians had to pass an examination before being classed as skilled electricians in the same way as gas fitters had to do. As to flame proofing and forced ventilation, Mr. Brockbank enquired what steps were taken if condensation was found. He asked also if the Midlands Electricity Board favoured the system of direct-on starting of motors. With regard to the generation of electricity on a gasworks, he felt that Mr. Bryan had emphasised the most important point, namely, the most economical way to use the electricity on the works. He also wondered if duplicate plant could be used under the guidance of the electrical engineer or would it be preferable to use diesel drives.

Mr. Bryan replying to Mr. Bath, said that his paper had given only the broad outline of the distribution system for electricity on a works: Ring mains were formed by linking two radial feeders where thought necessary. Two radial feeders running close together through the works also offered duplicate facilities, one in regular use for certain drives while the other could be used in the event of a power failure of the first. Power for lighting at 110V was obtained by transforming from the 440V system down to this voltage. Fluorescent light was very little used on the Birmingham works: The present system of lighting, he considered to be the best for the conditions under which it had to operate. In the sampling of oil from transformers, Mr. Bryan said that a certain amount of water and dirt collected at the bottom of the transformers and therefore the practice was to run up to a gallon of the oil to waste before taking the sample. Replying to Mr. Brockbank, Mr. Bryan expressed the opinion that 110V lighting was safer than a 240V system. He favoured multi-motor panels for a number of reasons, among them being that the interlocking of drives was easier when it could be done on one panel. Gas-making plant could now be erected quite quickly, he said, and there was often insufficient time allowed for the installation of electrical equipment—the provision of a multi-motor panel could, in most cases, substantially cut down site work. He said that electricians were not required to pass an examination at the end of their apprenticeship. The Electrical Trades Union would not agree to any restriction on an apprentice being classed as fully skilled at 21 years of age, provided his apprenticeship had been served with other electricians. This, he felt, was a poor feature of the Board's Apprenticeship Scheme. In connection with flame proofing and condensation, he agreed that the latter was a troublesome matter and it seemed to him that it was a question of providing some means by which the condensate could drain away or, alternatively, drawing the pressurising air from a locality free of moisture. Direct-on-line starting of motors was accepted by the Midlands Electricity Board, he said, because the electricity supply was received at sub-stations on the works at 11,000 V and this provided little disturbance of their system. In the matter of using electricity economically, shutting down generators was favoured by gasworks supervisors because it was an easy matter and an easier proposition than shutting down many small items of steaming plant, but a very heavy increase in electricity charges resulted, this could only be justified if it were a question of possible interference with gasmaking. Diesel generators or drives, he considered, could well be used for peak loads.

Mr. F. Grocott (Birmingham) asked for Mr. Bryan's view as to the relative merits of sodium and mercury vapour lighting for mechanical producer charging stages. On page 20 of the paper, said Mr. Grocott, he felt that the impression given there was that little control was exercised over the sizes of lamps being replaced and wondered if this meant that the larger 150W lamps were replacing those of smaller wattage and if this was so, what effect did this have on the amount of electricity consumed. He asked what was the wastage of apprentice electricians under the Board's Apprenticeship Scheme and what training was given. Mr. Bryan, replying to Mr. Grocott, said that 140W sodium lamps had been installed on a charging stage of five mechanical producers. There was slightly less lighting intensity with this type of lighting as compared with 400W mercury vapour lamps. Sodium lamps were slightly cheaper to install, but the colour of the light was the main factor of concern. However, when correctly placed and with complementary colour paint used in the area, they appeared quite satisfactory and, in fact, operators complained more about mercury vapour lighting than about sodium lamps. Lamps were being replaced by those of a higher wattage in order to increase the lighting intensity. Operators were always asking for larger lamps to be installed in their particular area, he said. As to the wastage of apprentices under the Board's Apprenticeship Scheme: During the last five years, 31 apprentices had been engaged, 12 had left, i.e., a wastage of approximately 40%. Apprentices usually had their National Service deferred until they had completed their apprenticeship, that is until after they had reached the age of 21. This meant that at the present time the Board did not benefit from the training given to apprentices until after an initial period of seven years.

Fluid Couplings

Mr. G. H. Potter (Birmingham) referred to Figures 2 and 3 in the paper which showed the cost of totally enclosed motors for direct-on-line starting. In some cases, he said, fluid couplings would be necessary and asked if they were 'weighted' in the figures.

Mr. Bryan replied that the use of fluid couplings was often dictated by the fact that the mechanical plant required a safeguard and so in many cases for that reason they were installed. It could be taken, he added, that motors of more than 20 h.p. would have a fluid drive for direct-on-line starting. If this were not so the starting period would be extended and might affect other plant. In such cases the higher cost of fluid couplings excluded from these figures would, he considered, be justified.

Mr. C. P. Astbury (Birmingham) said that in his paper, Mr. Bryan had stated that all installations were done by gas board staff and there was a suggestion that outside contractors were little used. Mr. Bryan had also stated that breakdown faults had been reduced by about 150 per year and for a full maintenance inspection of a works the period had been increased from two to six months, and Mr. Byran's comments were invited.

Mr. Bryan replied that in Table I of the paper the number of electricians shown was very small. Electricians were difficult to recruit, and it was for this reason that the Board's Apprenticeship Scheme was introduced. These apprentices had to be classed as skilled electricians at the end of their time.

The first of them had served their apprenticeships and were doing their National Service, but would soon be back. They would then supplement the present staff. The electrical staff was regarded as one unit, and individual electricians were moved from one works to another as necessary. As to the employment of outside contractors on the works, Mr. Bryan said that they were little used because by using his own staff there was a better control on the quality of installation. Nevertheless, outside contractors were employed away from the works and in isolated localities.

Mr. J. R. Kilvert (Birmingham) said he was interested in Mr. Bryan's remarks on page 26 of the paper in connection with economies in the use of electricity by restricting the KVA demand by shutting down plant. He considered that the meter measuring the KVA should be located in a more convenient position. On page 29 of the paper, regarding the generating of electricity on the works by the use of waste heat steam, low pressure steam, said Mr. Kilvert, was of greater value than Mr. Bryan had made it out to be, and could be used to generate electricity at approximately 60% of the cost of the imported energy.

Mr. T. Bryan agreed that KVA meters were not always in the most convenient position, but pointed out that they recorded KVA demand over 30 minutes periods. He therefore doubted whether a supervising foreman could take the necessary action to reduce demand and also keep looking at the KVA meter to see what it was recording. It was better, he considered, to work to a set plan which had for its object the restriction of the KVA demand. He agreed that the need for low pressure steam on a works provided a convenient means by pass out turbine to generate electricity, but most installations were primarily designed to produce low pressure steam with electricity as a by-product. He could not agree that electricity generated with low pressure steam cost about 60% of the electricity imported since he felt that it was difficult to assess the allocation of real costs to producing the various alternatives to using steam and to generating electricity. Further, continous generation inflated the cost of imported energy. He considered that Mr. Kilvert's assessment was therefore of doubtful value.

Heavy Replacement of Bearings

Mr. R. L. Tarratt (Birmingham) referred to page 19 of the paper, where Mr. Bryan showed in Table 5 that the number of replacements of bearings in motors was still relatively high. Where fluid couplings were used it had been found essential to obtain alignment within .005 in. The failure of motor bearings Mr. Bryan attributed to poor alignment. The makers, said Mr. Tarratt, asked for alignment within .002. The reason for this was that a fluid coupling should not be looked upon as a flexible coupling and it was therefore essential for the bed plate carrying the gearing and the motor to be as rigid as possible. He felt that as to restricting the KVA demand, the diesel generator might well come into its own as a cheaper proposition.

Mr. Bryan agreed with Mr. Tarratt's observations regarding the alignment of motors where fluid couplings were in use and also with Mr. Tarratt's views on the subject of diesel generators.

Mr. Harvey (Nottingham) referred to the generation of electricity on the works, and said that the importance of low pressure steam has already been stressed by the previous speakers, but this must be of constant supply and at off peak times some of the generated electricity if not absorbed would be exported. He asked for Mr. Bryan's comments as to whether in producing electricity it would be a good proposition to run, as it were, in parallel with the Midlands Electricity Board. He requested Mr. Bryan's views on the use of mineral insulated copper cables in gasworks.

Mr. Bryan said that at off peak periods the works generators might export electricity, but the works would receive only one-third of the price compared with what it paid for the imported energy. It therefore followed that all electricity produced on the works should be used as far as possible and at no time should there be a surplus for export to the Midlands Electricity Board. Mineral insulated copper cables, said Mr. Bryan, were little used in the Division, but they could be used satisfactorily in 80-85% of localities on the works. The difficulties were two-fold, *viz.*, training of personnel in the technique for their installation, and large quantities of cable and accessories would have to be held in stock.

Mr. G. M. Rimmer (Electrical and Mechanical Engineer, West Midlands Gas Board) thanked the President for inviting him to be present, and said that there were many concepts as to which was the best system to adopt in using and generating electricity economically. Accountants, he said, often produced figures to prove that one's own method was wrong, but it was the overall power service which should be taken into account. The policy of his board was to adopt back pressure systems and use electric drives wherever possible. Regarding the use of diesel generators: Mr. Rimmer reminded the meeting that the primary function of the board was to make gas, and therefore the board must be prepared to pay the Midlands Electricity Board's standby charge. He also confirmed that the Midlands Electricity Board had always been prepared to accept direct-on-line starting.

Cables Above or Below Ground ?

Mr. Foxton (Cheltenham) asked if Mr. Bryan preferred electric cables to be above or below ground, and wondered whether there was any medical evidence that sodium lighting had a harmful effect on the eyesight of operators.

Mr. Bryan replied that he would prefer to run cables on the sides of buildings if at all possible, alternatively, provided the ground was good, then underground. As to sodium lighting and its effect on the eyesight of operators, he said there was no medical evidence to suggest that either mercury vapour or sodium lighting was in any way harmful to the eyesight.

Mr. R. L. Tarratt recalled that he was working at Manchester during the war when drawings marked in red in the firm's drawing office could not be seen in the factory where sodium lighting was installed. It was a feature of sodium lighting, he said, that all reds disappear.

Mr. H. S. Smith (Birmingham) referred to the standardisation of electric motors, and considered that standardisation would lead to the installation of larger motors than was necessary with lower efficiency, increased electricity consumption and greater costs.

Mr. Bryan did not agree with Mr. Smith since he felt that the power factor of the system was a more important feature than the small increased consumption, and explained that it was preferable to have a smaller number of standard motors and connect static condensers to correct for the drop in the power factor of the system. This would be cheaper, he contended than by having more smaller motors for which a large range of spares would have to be held in stock.

Tests for Vehicles

IN the very near future motor vehicles, including commercial vehicles up to 30 cwt., which were first registered more than ten years previously, will require a certificate of roadworthiness before they can be used on the roads. They may be in perfectly sound condition with many more years of life before them but on the other hand a lot of old vehicles need a thorough overhauling if they are to be allowed to be driven on the roads. Worn and smooth tyres, defective brakes and steering, are perhaps some of the more common defects which are to be found.

Although under the Road Traffic Act, 1956, the new requirements of certificates of roadworthiness are limited to cars first registered at least ten years ago, it is interesting to observe that the Minister may restrict, though he may not enlarge, this period. Cars of less ancient vintage than ten years may, therefore, if the Minister so determines, be made subject to the new regulations as to roadworthiness.

Again, although the new restrictions may extend to vehicles of all classes and descriptions, the Minister is given a discretion to restrict their ambit, and vehicles of such classes or descriptions as the Minister may select, may be exempted from the new requirements.

Assuming that the vehicle has been first registered at least ten years ago, it will be incumbent to obtain the necessary test certificate in respect of it before using it on the highway.

If this certificate has not been obtained, then every person who uses the vehicles on the highway, or causes or even permits it to be so used, will be committing an offence.

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